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VIEWS, NEWS AND INTERVIEWS.

The Melilla correspondent of the United Press telegraphed under date of Monday, November 13: "At 11 o'clock last evening the electric search lights of the Spanish cruisers, 'Alfonso XII,' 'Conde de Venadito' and 'Melilla,' suddenly illuminated the whole country around, taking the Rif natives by surprise. A terrible cannonade was opened by the war ships and the forts at the same moment. The terrified natives could be seen running about like madmen, seeking shelter in the caves. Many were killed."

The experience of a prize-fighter's wife with the telephone is graphically told by a daily newspaper reporter, as follows:

"Did I ever see a prize-fight? Well, I should hope not. No lady would ever do such a thing, any more than she'd wear one of those dreadful crinoline skirts. The nearest approach to seeing a fight which I ever reached was the night of Mr. Griffin's fight at Bath Beach. When one of Jimmie's fights is on I always go to some place where I can get the news as soon as possible. I generally go by myself, because I would rather be alone at a time like that. The night of the Bath Beach fight I went to the drug store and got a first mortgage on the telephone.

"Then I telephoned to Central and I said to him:

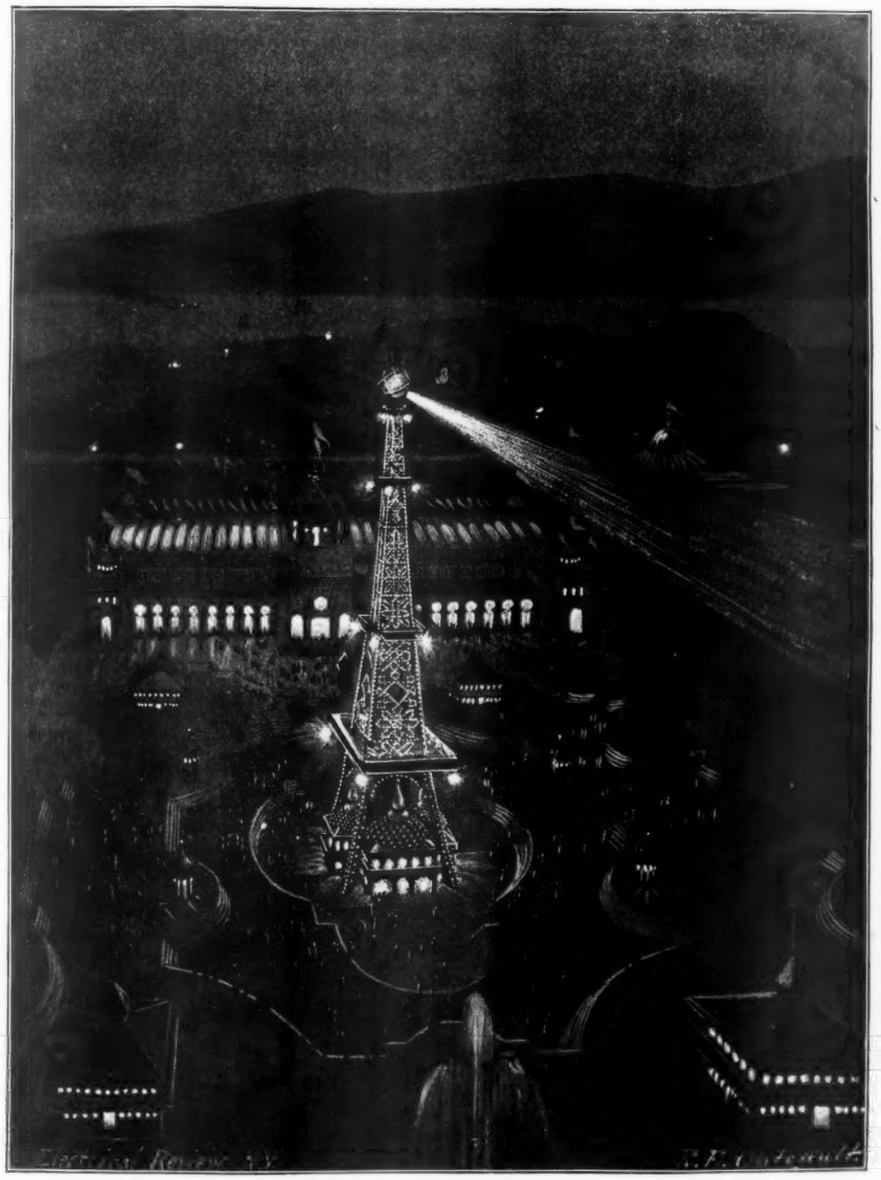
"'I'm Jimmie Carroll's wife and I want to know how the fight is getting on, round by round.'

"'Very well, ma'am,' he called back; 'I'll fix you all right.'

"And he did. He arranged the wire so that I could hear them calling off particulars right from the hall itself. I don't think I ever was so excited in my life. When the word came that the fight was Johnnie's I just pulled my handkerchief out and hurrahed away all by myself. I'm sure the people in the shop must have thought I'd gone crazy."

It is reported that Mr. Donald Murray, of Sydney, New South Wales, has devised a system for setting type by telegraph. Mr. Murray claims that it is possible by his invention to operate at a distance, over a single telegraph wire, a typewriter, a type-setting machine, a piano or any other keyboard instruments.

At various points on the Bosphorus the current from the Black Sea to the Mediterranean has prodigious force, and it is now proposed to harness some of this waste power for the lighting of the whole city of Constantinople and a considerable length of the adjacent coast by electricity. The way in which the inventor intends to turn the ocean currents to account is to erect three very powerful dynamo machines upon the three points of the Bosphorus where the current has the greatest force, and, so far as can at present be learned, the project appears to be practical and realizable.



THE ELECTRIC TOWER OF LIGHT AT THE CALIFORNIA MIDWINTER EXPOSITION.

An Electric Tower of Light.

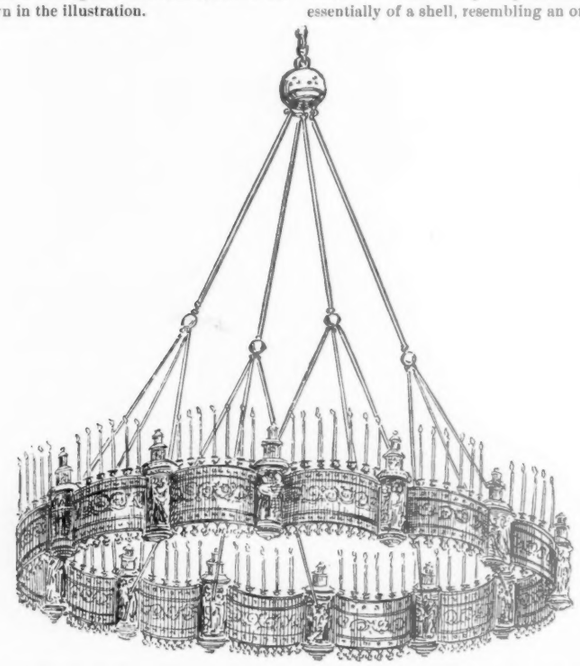
THE MOST PROMINENT FEATURE OF THE CALIFORNIA MIDWINTER EXPOSITION.

The illustration on this page has been prepared from authoritative data and gives an impression of a night scene at the California Midwinter Exposition, where it is proposed to have a magnificent tower of light. To obtain this bird's-eye view the observer is supposed to be standing on Strawberry Hill, in Golden Gate Park, San Francisco, where the Exposition is to be held. In the background, beyond the water, are the foothills of Alameda and Contra Costa counties, the cities of Oakland and Alameda and the town of Berkeley. The large building in the middle ground is the Manufactures and Liberal Arts Building and the smaller structures are National Restaurants. The central feature of the scene is the tower of light, which, while not extraordinarily high, will afford a magnificent view of San Francisco, the Bay, the Golden Gate and the surrounding country.

As the plans are now prepared the main buildings will face a depressed Court of Honor, capable of great artistic landscape treatment, in the center of which the tower will be located. This will be a skeleton structure 50 feet square at the base and rising to a height of 260 feet, with four *etageres* or landing places. Four Moorish pavilions, 60 feet high and gorgeously decorated in colors, will occupy the spaces between the supports of the tower at the base. The first floor will be 80 feet from the ground, the second 140 feet, the third 210 feet and the fourth 260 feet. All these will be open to the public, except the highest one, from which the powerful search lights will be operated. While the principal purpose of the tower is to afford light, it will be used as a grand band stand, from some part of which music can be heard at all times. An immense gold ball caps the tower and on this ball will be the figure of a bear, the emblem of the State of California.

The lighting of the tower, for which the Western Electric Company, of Chicago, has

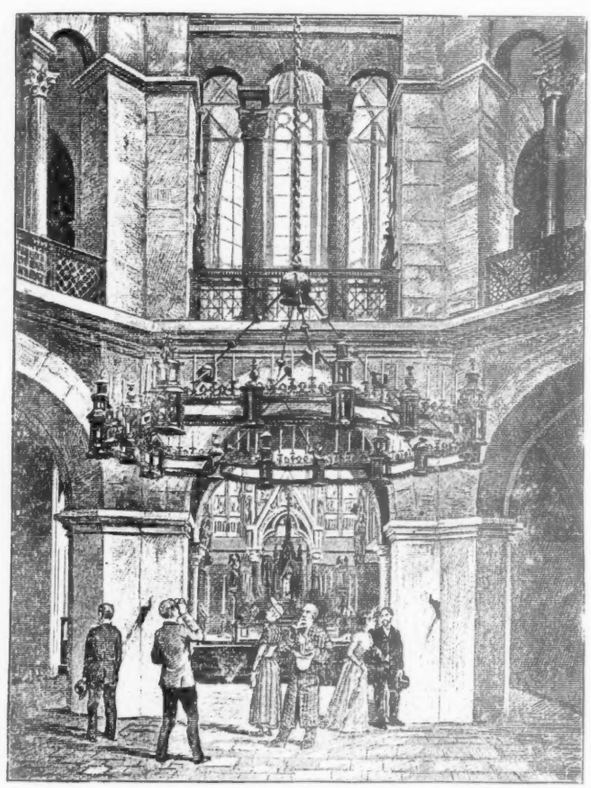
the contract, will be accomplished by from 2,500 to 5,000 incandescent lamps, about 50 arc lights and several search lights. Current will be supplied from the exposition power plant in Machinery Hall, which is located at the right of the tower, but is not shown in the illustration.



Evolution of the Fixture Art.—Candle Corona from the Church of St. Remi, Rheims.

Lieut. W. F. C. Hasson is the electrical engineer for the Midwinter Exposition.

While the final plans for the tower of light and the method of placing the lights have not been fully decided upon, it is believed that our illustration presents a view which will be found practically accurate.



Candle Corona of Bronze in the Cathedral at Aix-la-Chapelle.

Thomson-Houston Cars in Italy.

A few days ago trial runs were made on the electric street railway which is approaching completion, in Milan, Italy. The cars are capable of accommodating 34 passengers and have been constructed in Italy. The line is on the Thomson-Houston system.

A New Thermostat.

A very ingenious automatic fire alarm system was recently exhibited at No. 59 Liberty street, New York, in the rooms of the Automatic Fire Alarm Company, of Baltimore. The device itself is very simple, and consists essentially of a shell, resembling an ordinary push button, which has on its outer face a strip of hard rubber about three inches by one inch by one-eighth inch. The action is as follows:

In the rear of this strip of hard rubber is placed a spring, at one end of which is a platinum contact, the other end being fastened. Through the middle of the spring is passed a steel screw which just touches the rubber plate in front. The platinum contact is so adjusted by means of this screw, that it just does not touch a corresponding platinum contact to which is connected one wire from the circuit. The other terminal is connected with the spring carrying the steel screw.

Hard rubber possesses the peculiar quality of buckling when subjected to change of temperature. The plate of hard rubber being fastened to the brass frame, is susceptible only of an in and out motion, which is occasioned by a raise in temperature. The steel spring serves as a device to allow this thermostat being set for any degree of temperature. The thermostat is connected in the same circuit with the usual district telegraph service, and upon contact being made from an undue amount of heat, the recording instrument at the central station continues to mark off the calls until the current is broken by the attendant.

The company, as it now exists, also manufactures another device, consisting of a combination of call box and thermostat. A company will soon be formed with a large capitalization, with Willard D. Day as president, John G. Crump, vice president, John C. Powell, secretary, and Harmon W. Day, treasurer and general manager. The home office of the company is now No. 7 North Charles street, Baltimore, Md. A large field for the introduction of these thermostats is in small towns not already provided with messenger service. The State of Texas is a fertile field. Mr. C. D. Lancaster has this in charge. These thermostats, it is stated, will not be sold, but will be rented in conjunction with messenger systems, so that the source of revenue will be from the board of underwriters, at 10 per cent. on premiums on risks having these thermostats installed.

The Evolution of the Fixture Art and Decorative Illumination.

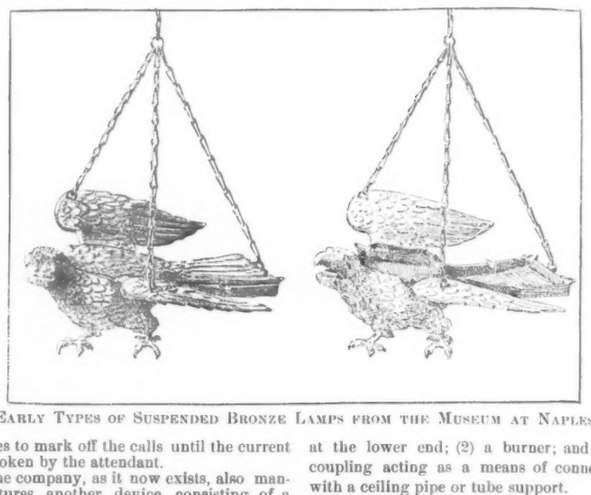
READ BEFORE THE ASSOCIATION OF EDISON ILLUMINATING COMPANIES, AT NEW YORK, AUGUST 12, 1891.

BY LUTHER STIERINGER.

(*Continued from page 149.*)

EVOLUTION OF GAS FIXTURES.

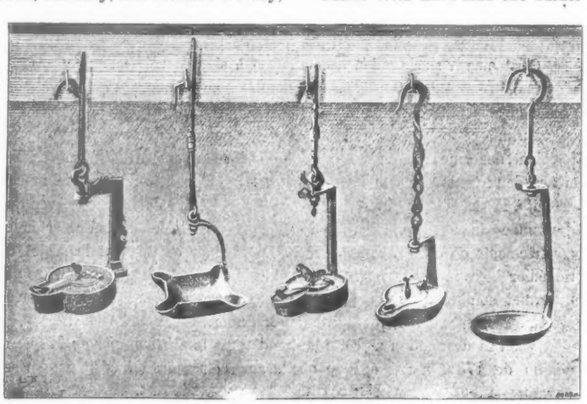
First: The simplest structure, consisting of (1) a straight pendant pipe curved upward at the lower end; (2) a burner; and (3) a coupling acting as a means of connecting with a ceiling pipe or tube support.



Early Types of Suspended Bronze Lamps from the Museum at Naples.

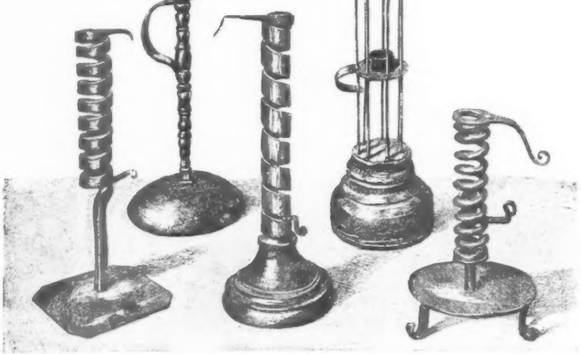
Second: A break in the continuity of the pipe, usually near the burner, for the controlling device or cock.

Third: With more than one burner (1) a threaded shaft; (2) a distributor; (3) arms with keys; (4) burners; (5) rigid ceiling coupling.



Early Forms of Portable Lamps Made of Forged Iron.

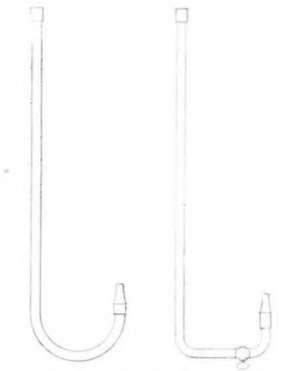
Fourth: Ornamentation of this skeleton with (1) enclosing shell for the central distributor; (2) sleeves or tubes covering the arms and shaft; (3) ball or pendant terminals; and (4) canopy to form an ornamental finish near the top of the fixture. This canopy is proper even if the shaft be extended far above as a pendant.



Early Forms of Adjustable Candlesticks Made of Forged Iron.

In these dressings of the fixture the shells or sleeves usually fit closely around their respective stems or pipes, leaving no clear spaces for conductors or any medium other than the gas conveyed through the interior of the pipe.

MODERN OIL LAMP FIXTURE.

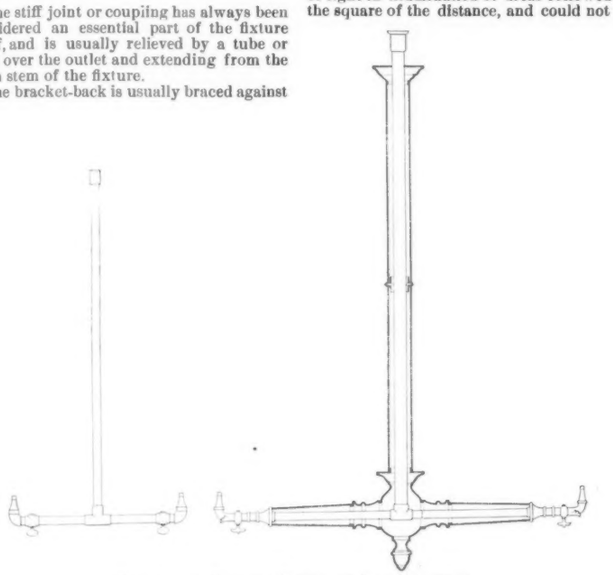


FIRST AND SECOND TYPES OF GAS FIXTURES.

The point of support is always preferably the pipe system above or at the side of a room, this forming the best possible anchorage.

The stiff joint or coupling has always been considered an essential part of the fixture itself, and is usually relieved by a tube or shell over the outlet and extending from the main stem of the fixture.

The bracket-back is usually braced against the wall or ceiling when the canopy comes some distance down on the stem.



THIRD AND FOURTH TYPES OF GAS FIXTURES.

ELECTROLIERS.

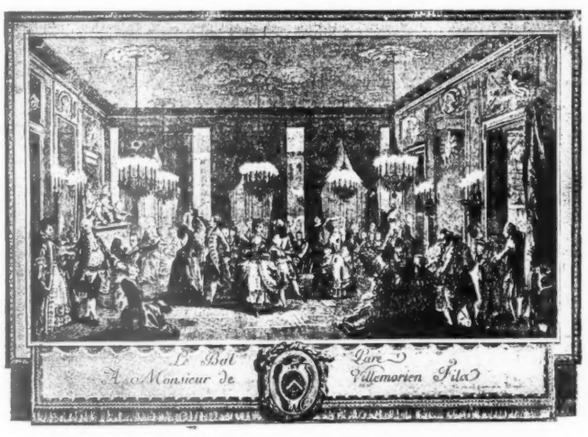
The introduction of the incandescent electric light has, in some respects, modified essentially the construction of pendant fixtures.

When at the outset it was realized that the construction of the Edison lamp would allow of its being placed in an inverted position, it was at once assumed that such fixtures as had been necessary in the use of oil, candles and gas would no longer be required, and that the new illuminant would be attached in all sorts of ways to the ceilings, the walls, the woodwork of the room, placed in niches, in pillars, concealed behind luminous disks, and that in other ways the former practices would be revolutionized. But a short time was needed, however, to dispel these fancies, as far as they applied to ordinary commercial work. It being quickly realized that the loss in distribution of light in illumination of areas followed as the square of the distance, and could not be ignored, and that consequently the suspension of lamps in a position approximately in the center of the space to be illuminated, precisely as experience had dictated in the use of gas, would prove far more economical than any other method.

As with the gas chandelier, the medium furnishing the energy for the light being brought from without, the method of placing the conductors upon the fixtures early claimed careful attention. The original idea was to bring them from the wall or ceiling without a break, leaving the ends long enough to reach down through the fixture to the socket, and in this way all the first electroliers at the Edison Company's old office, 65 Fifth avenue, were made. Only a short time, however, was required to show that the fixture should contain these conductors as a part of itself, and that consequently there should be a point of junction between the permanent wiring of a building and the movable wiring forming a part of the pendant; also that this junction should be at or near the ceiling or side wall. The same reasoning settled that this point should be above the stiff joint, which, as before stated, was distinctly a part of the fixture. The junction would, therefore, come in sight below the ceiling plate. Hence the development of the sliding shell, adjustable by a screw, to cover what would often be an unsightly junction.

This original distinction thus made plain between the wiring of electroliers for the connection of incandescent lamps as a part of the fixture itself, and the wiring of gas fixtures for electric gas lighting, after the fixture was in place, and as a part of the system of conductors extending through the building, emphasizes the radical difference between the two methods, as well as between the objects to be attained.

(To be continued.)



BALL-ROOM LIGHTING BY CANDLES IN THE EIGHTEENTH CENTURY.

COSTUME OF CANDLE MAKER.—FROM THE ORIGINAL ENGRAVING OF LARMESSIN.

A CANDLE MERCHANT.—FROM AN OLD ENGRAVING.

The telephone line is being extended from Hillsborough to Washington, N. H.

ELECTRICITY ON THE ERIE CANAL.

SUCCESSFUL TRIAL NEAR ROCHESTER, N. Y.—CANAL TRADE WILL BE BENEFITED—POSSIBILITIES OF TRAILERS AND CANAL BOAT TRAINS.

The first public trial of the "Frank W. Hawley," the canal boat propelled by electricity, took place at Pittsford, New York, on the Erie Canal, between locks 63 and 64 of Saturday, November 18.

The State of New York appropriated the sum of $10,000 toward experimenting upon the application of electricity to canal boat propulsion. It had been thought by many that the use of a propeller in a canal would be detrimental to the bank, that the repeated swash and beating of the water against the walls of the canal would be so destructive that it would not be advisable to employ a rotary motion for moving the boats. This theory took such a hold that for some reason the use of motors on canal boats was not thought practical. Then again the installation of central stations was deemed too expensive an outlay to be considered economical. For these reasons nothing was done in this respect, but with the advent of the Niagara Falls Power Company, the facilities thus offered for canal boat propulsion made the scheme plausible.

The Westinghouse Electric and Manufacturing Company, of Pittsburgh, in conjunction with the Niagara Falls Power Company, assisted by Frank W. Hawley, undertook to fit out a canal boat and give the idea a practical test.

With the power available there could be no reason why the apparatus should not be perfectly successful in its operation. The "Frank W. Hawley," an ordinary canal boat, was provided with Westinghouse motors similar to those used on their street cars. Two trolley arms were used, as it was not thought advisable to use the water for the return circuit. A temporary trolley line was erected, having, of course, two overhead wires.

When all was ready for the trip a preparatory trial was made Friday evening to be sure that everything was in working order.

On the day of the trial, Saturday, Governor Flower took the helm, and carrying about one-half the usual load the boat moved off attaining a speed of about five or six miles per hour.

Those present at the trial were: Governor Flower, Frank W. Hawley, the wealthy stock-raiser of New York and Pittsford, who has had the management of the preliminary arrangements, Nikola Tesla, Geo. Westinghouse, Jr., Lemuel Bannister, Superintendent of Public Works Hannan, Surveyor Schenck, and many others who are interested in the project.

A prominent engineer who was present at the trial declared that he could see no possible reason why electricity should not supplant the patient mule, and that the apparatus, being no departure from the ordinary, should not operate to perfection.

The steering of the boat is not in the least affected and no driver is necessary in any emergency. Trailers may be attached and one boat may serve to draw six or seven heavily loaded boats. The motors used will be calculated for about 500 volts, and it is not definitely stated what the exact design will be to be applicable to this departure.

In this trial trip the power was obtained from the Rochester Street Railway Company's power house, whose mains generally carry about 500 volts, but only 400 were employed at the boat.

It is merely a question of time and the amount of available current furnished when the entire canal system will be operated by electricity. Difficulties may arise which, of course, cannot be foreseen and which only actual experience can enable the engineers to obviate, but as this is the first application of electricity obtained from a central station, to the motive power of boats, a field is thus opened which is full of possibilities.

The Boston and Maine is installing a 500 light plant at Mystic Wharf, at Charlestown, Mass., for lighting the freight sheds.

Electrical Apparatus on "El Cid."

By the time this issue of the ELECTRICAL REVIEW reaches its readers it is almost certain that "El Cid" will be on her way to Brazil to assist in putting down the rebellion against the government. The Naval Academy men mentioned in the ELECTRICAL REVIEW last week have been assigned to official positions as follows: Senior watch officer, McDonough Craven; second lieutenant, J. R. Brinley; third lieutenant, John J. Brinley; fourth lieutenant, Fred. H. Sparling; fifth lieutenant, A. Y. Lowe. Four electricians have also been shipped.

"El Cid" has as complete an electrical equipment as a first-class man-o'-war. The contract for the work was let on November 2, with the condition that the entire equipment should be installed and in thorough working order by November 12. On the evening of that day, just 11 days after the signature of the contract, the switches were closed and everything pronounced in perfect working order. This is a record, in view of the difficult and special character of marine electrical work, and the extreme care that must be taken to avoid accidents and errors.

The plant consists of two 10x10 fifty horse-power engines, each belted to a standard General Electric compound wound bipolar dynamo of 30 kilowatts (40 horse-power) or 540 sixteen candle-power lamps capacity each. Upon an incombustible slate switch board near the dynamos are mounted a full complement of marine volt and ammeters, and a double pole knife switch for each circuit leaving the board. There are five circuits for the 300 incandescent lamps installed, two for the search lights and one for the 50 horse-power motor. The switch board is so arranged that either dynamo can be used either on the motor or lighting circuits.

The wires from the board are led through a special moulding, and wherever exposed to moisture are provided with a leaden armor. All the appliances, such as switches, receptacles, etc., are of the same water-tight pattern as used on the United States war vessels, as are also the fixtures, portable lights, deck and battle lanterns. For the last named a separate circuit has been provided. They can thus be carried from place to place, and connected at different convenient points.

On the roof of the pilot-house is set the automatic 30 inch search light, similar in size and intensity to that on Mt. Washington, which throws a beam of light which can be seen from Portland, Me., 85 miles away. That on the "El Cid" is flanked on both sides by Hotchkiss rapid firing machine guns, and it can project a beam of light from its spherical concave mirror sufficiently powerful to allow light colored objects to be easily distinguished at 6,000 yards. It is furnished with a diverging door made of strips of glass, by which the beam can be diverged horizontally to cover a wide space, and permit of the discovery of an object moving in the field of light. The diverging door is then moved back and the full light of the beam concentrated upon the object, and render it an easy mark for the guns. The lamp takes a current of 100 amperes to produce an effective arc between the points of the two 1¼ inch carbons.

In the pilot-house is a small switch board. From this the search light is electrically controlled and may be moved in any direction horizontally or vertically. The small motors which do this work are concealed in the iron pedestal of the projector. The after search light is used as an auxiliary. It is of the same pattern, but has a mirror of only 12 inches, and is hand controlled.

The "Brittania," the other vessel which is to take part in the discussion, will be fitted with one 24 inch and one 12 inch projector. The 50 horse-power motor is used to train the dynamite gun, which can be raised, lowered or turned to left or right as required. A system of electric signals completes what is the most rapidly installed naval electrical equipment on record. The work was done by the New York department of the General Electric Company.

A New Lighting Contract at Salem, O.

The Salem, O., Electric Light and Power Company has just closed a contract with the city to install and operate for 10 years, 100 1,200 candle-power arc lights to displace the old system of 325 incandescent lamps of 25 candle-power each. The arc lights are to be in operation by February 1, 1894.

American Institute of Electrical Engineers.

REPORT OF COMMITTEE ON LOCAL MEETINGS.

At the regular monthly meeting of Council, held at 12 West Thirty-first street, New York city, on November 15, five associate members were transferred to membership upon recommendation of the board of examiners. The committee on local meetings of the Institute presented its report, which was accepted and referred to the meeting of the Institute in the evening for discussion, and was adopted with some slight amendments. The report appears in full below:

To the Council: Your committee appointed at the meeting of the Institute of October 18, to consider the subject of local meetings, beg to report as follows:

1st. It is the opinion of the committee that provision should be made for local meetings of the members at points inconveniently distant from New York for the reading and discussion of papers accepted by the Institute.

2d. The committee is of opinion that the provision in Section VI of the Rules of the Institute, authorizing the secretary to "call a special meeting on a requisition signed by 15 or more members," was not intended to and does not cover local meetings of the character contemplated in this report.

3d. The committee presents the following plan for the holding of local meetings of members:

A. When not less than 20 members in any stated locality shall, in writing, notify the secretary of the Institute of their desire to hold local meetings, such request shall be presented to the Council at its first meeting thereafter. The Council shall then, upon the recommendation and nomination of the signers of the request for local meetings, appoint a local honorary secretary, who shall be a member or associate member of the Institute residing in the specified locality.

B. The duties of a local honorary secretary shall be in general to serve as a channel of communication between local members and the general body of members through the secretary and Council. But no member in any locality shall be debarred from direct communication with the Institute.

C. In any locality where a local honorary secretary shall have been appointed, local meetings may be held, the local members to elect their own chairman; such meetings to be known as meeting of the members of the American Institute of Electrical Engineers, and such meetings shall be for the purpose of reading, by the authors or by proxy, and of discussing papers accepted by the Institute and such papers only. Such local meeting shall be held simultaneously with the Institute meetings or subsequently; that is to say, no paper before the Institute shall be read or discussed at a local meeting in advance of its reading at the Institute meeting.

D. Wherever local meetings shall have been provided for, as in the foregoing section, the local honorary secretary shall be supplied by the secretary of the Institute with a suitable number of advance copies of papers to be read before the Institute, which copies he may distribute to the local members at their local meetings. The local honorary secretary shall transmit to the secretary of the Institute a report of the discussion at each local meeting, together with any written discussions or comments on papers that he may receive from members in his locality.

Any member or associate may introduce a stranger to any meeting, but the latter shall not take part in the proceedings without the consent of the meeting.

E. The local honorary secretary shall transmit to the secretary of the Institute all papers offered by local members, but any member may send papers directly to the secretary of the Institute.

F. The publication of the discussions at local meetings in the transactions of the Institute shall be subject to the same regulations and restrictions as govern the publication of discussions at the regular meetings of the Institute. No publication of papers or discussions at local meetings in local or other journals or newspapers is to be permitted without the sanction of the Council or the secretary of the Institute.

G. The expense of local meetings shall be borne by the local members and not become a charge upon the funds of the Institute.

H. The title, name and address of each local honorary secretary shall be printed in the publications of the Institute.

In dealing with the subject before it, and in preparing its report, your committee has carefully considered the documents and correspondence placed in its hands; particularly the paper of the secretary on "Monthly Meetings," and the plan for the establishment of chapters of the Institute drawn up by Dr. Emery, both of which were read at the October meeting.

The scheme for local meetings suggested in this report has been designed with the purpose of affording to members distant from the headquarters of the Institute opportunity to participate in its work on substantially the same footing as members whose location permits them to attend the meetings held in New York. The Institute is a national body, having members in every section of the country, but with a large preponderance of membership relatively near headquarters. Its work and its publications have a national significance. Its subdivision into sections or chapters would detract from the unity and strength of its effort to serve the best interests of electrical science and industry.

Your committee, therefore, is of opinion that it would not be for the welfare of the Institute to create any separate local organizations or any class or classes of members not now provided for in its rules.

It is believed that the plan for local honorary secretaryships and for local meetings herewith submitted, would meet fully the desire of members in diverse parts of the country to participate in the work of the Institute, and that it would avoid the disadvantage and disintegrating tendency that might arise from the formal establishment of a number of separate and distinct sub-societies.

HERBERT LAWS WEBB, *Chairman.*
A. E. KENNELLY,
M. I. PUPIN,
WM. J. HAMMER,
GEO. M. PHELPS.

New York, November 10, 1893.

Electricity to Overcome the Thrust of Ships' Shafts.

How conducive it is to an interchange of ideas to lunch with such men as Nikola Tesla and Jarvis B. Edson. Seated at a table, discussing the most enjoyable meal, sat the two gentlemen above-mentioned and the writer, and the following subject came up for discussion:

Mr. Edson stated that marine authorities have given the thrust upon the thrust bearing of ships as variously ranging from three to five per cent. It was not long with these two minds at work before a theoretical solution was obtained. Why not overcome this thrust by surrounding the shaft in such a way with coils to obtain a magnetic pull in the opposite direction, and thus avoid this loss?

Mr. Tesla, in the spirit of an economist, thought most favorably of this solution and it seems that there can be little doubt that it is indeed plausible. On a large vessel such a loss is not inconsiderable, and it would be a good idea if the members of the American Society of Naval Architects and Engineers, who met at the rooms of the American Society of Mechanical Engineers of this city last week, would give this subject their consideration. The subject is a pertinent one and much good might result from a discussion among the members.

An Electric Road For Tokio, Japan.

When an electric street railway was completed for public use in Bangkok, the capital of Siam, last year, by Ohio capitalists, the Rev. J. M. Law, a medical missionary in Japan, thought that a similar enterprise would be profitable and of great public benefit in Tokio, the capital of the Japanese empire, containing 1,400,000 persons.

A few months ago he got Ohio capitalists to subscribe $100,000 to the scheme, with the assurance of additional capital after the plan was further advanced. Dr. Law then went to Japan, and, backed by the influence of American and other Ambassadors, obtained one of the most liberal charters ever granted by Emperor Mutso Hita. The intention is to run a line from Tokio to Yokohama, a distance of 30 miles, and build a network of lines in both cities. J. W. Goss and Engineer Riblet have just sailed for Japan to inaugurate the scheme.

A Manual Training School for Brooklyn.

The Brooklyn, N. Y., Board of Education has resolved to establish a regular manual training school in the old high school at Court and Livingston streets. The principal is to be employed at $3,000 a year, and $7,500 more is to be spent for assistants. The school is to be fitted up with all the latest appliances for manual training.

AGAINST EDISON.

JUDGE LACOMBE'S DECISION IN THE LAMP CASE MODIFIED BY THE CIRCUIT COURT OF APPEALS—THE OPINION IN FULL.

The Circuit Court of Appeals handed down a decision on November 13 in the case of the Edison Electric Light Company against the Mount Morris Electric Light Company and the United Electric Light and Power Company, of New York.

About six weeks ago Judge Lacombe handed down a decision in favor of the Edison Company, enjoining the Mount Morris and United companies from using in this city lamps infringing the Edison patent.

The defendants took an appeal to the Circuit Court of Appeals, which has just handed down a decision, Judge Shipman writing the opinion, reversing the order of Judge Lacombe in so far as it affects the customers of the Mount Morris and United companies taken on prior to the first decision of the court in favor of the patent. The date of this decision sustaining the patent was July 14, 1891. The opinion of Judge Shipman appears in full below:

UNITED STATES CIRCUIT COURT OF APPEALS.

FOR THE SECOND CIRCUIT.

EDISON ELECTRIC LIGHT COMPANY AND THE EDISON ELECTRIC ILLUMINATING COMPANY OF NEW YORK
vs.
THE MOUNT MORRIS ELECTRIC LIGHT COMPANY, *et al.*

EDISON ELECTRIC LIGHT COMPANY AND THE EDISON ELECTRIC ILLUMINATING COMPANY OF NEW YORK
vs.
THE UNITED ELECTRIC LIGHT AND POWER COMPANY.

SHIPMAN, C. J.—

These appeals are from orders of the Circuit Court for the Southern District of New York, which granted preliminary injunctions to restrain the infringement, by the defendants, of the second claim of letters patent No. 223,898, dated January 27, 1880, to Thomas A. Edison, for an incandescent electric lamp. The patent is commonly called the incandescent lamp or the filament patent.

The Edison Electric Light Company, hereinafter called the Light Company, is the owner of the patent, the second complainant, hereinafter called the Illuminating Company, "is the sole and exclusive licensee of the right to use and vend incandescent electric lamps under such patent in and for the city of New York, for that portion of the city lying below Seventieth street, and it seems not to be disputed that the lamps used by the defendants are so used within that portion of the city."

The Illuminating Company was incorporated in December, 1880, for the purpose of producing electricity and distributing it for light, heat and power in the city of New York, and on March 23, 1881, made its first contract with the Light Company, by which it secured an exclusive right to use the Edison patents, among which was the incandescent lamp patent, in certain portions of the city. It has paid to the owners of the Edison patents, for its exclusive rights, in cash and in stock at par, more than a million dollars, and its investments for the purpose of a general system of incandescent lighting have been exceedingly large. In May, 1885, the Light Company commenced its suit against the United States Electric Lighting Company to test the validity and establish the scope of the lamp patent, which was decided by the Circuit Court for the Southern District of New York, on July 14, 1891, and by this court, upon appeal, on October 2, 1892.

The United Electric Light and Power Company, now an extensive incandescent lighting company, was organized in February, 1887, and commenced business in 1888. "It, thereafter, in 1889, entered into such relations with the United States Illuminating Company that the business of the two companies was conducted practically under one management." The last named company was organized in February, 1881.

The Mount Morris Company was organized in 1886 for the purpose of furnishing electric power and electric light, both arc and incandescent. In 1888 it commenced to furnish incandescent light, which is now the principal part of its business. Each of these companies has a very large capital, has invested large sums in its business, and each asserts that the principal part of its investment would become valueless, if it could not pursue the business of incandescent lighting.

It is said that the lamp patent will expire in November, 1894. The defendant companies are anxious to supply themselves with the Edison lamps. The light company is prevented from selling, for use within the territory occupied by the defendants, to other than its exclusive licensee. The illuminating company has recently declined to sell the patented lamps to the defendants. No question was made before the Circuit Court, or is made upon this appeal, as to the validity or scope of the second claim of the patent, or as to the fact of its infringement by the defendants.

The defendants rest their opposition to the orders of the Circuit Court entirely upon the equities which are alleged to exist in their favor, and to be large and imposing. The defense of laches or delay on the part of the owners of the patent, in enforcing or prosecuting their rights by litigation, of neglect to give infringers timely notice of the monopoly which the owners claimed, and their acquiescence in the conduct of infringing and rival companies, a defense which has become familiar in this litigation, has been again urged. The facts, in the former cases, were insufficient to justify this defense, and these defendants, which did not come into existence until a year or two after the test suit was commenced, and which did not begin the business of incandescent lighting for a period of three years thereafter, have no important new facts to present. It is sufficient to quote with approval the remarks of Judge Lacombe upon this point: "This defense of laches or delay on the part of the owners of the patent was urged upon the Court of Appeals at very great length, upon most voluminous evidence in Edison Electric Company *vs.* U. S. Electric Lighting Company, 52 Fed. Rep., 300, and that court decided that no case was shown to authorize the refusal of an injunction on any theory of laches or equitable estoppel, by reason of undue delay in bringing suit, or acquiescence in known infringement. Subsequently the same point was urged upon the same court again at great length, in Edison Electric Light Company *vs.* Sawyer-Man Electric Company, 53 Fed. Rep. 592, and the same opinion expressed.

"The facts presented here do not change the situation so far as the complainants are concerned, the same measure of delay is shown and the same excuse for that delay is also shown. Twice has the Court of Appeals held that the original test suit (that against the United States Electric Lighting Company) was timely begun and pressed with proper diligence. It has also held that, such suit proceeding with due diligence, no other infringers of the patent can be heard to complain with reason, that separate suit was not brought against them. Further discussion of the same facts in this court is unnecessary and out of place. The situation is not changed by the circumstances that these are different infringers with a different history from that of the defendants in the earlier suits."

The defendants next urge that they are illuminating and not manufacturing corporations, and have an equitable claim to consideration "growing out of the obscurity of the patent, and the fact that prior to the decision of the Federal Court in this circuit, sustaining and construing it, there were conflicting decisions upon it in foreign countries," and invoke in their favor the general remarks of this court in the Sawyer-Man case, discriminating between manufacturing companies, who were competitors of the Edison companies and users of lamps. The court said: "The users who have supplied themselves with electric lighting plants from the infringers, which required for their operation lamps of the patent, are, of course, infringers. But those who did so before the decision of the Circuit Court sustaining the patent, and at a time when judicial decisions in foreign countries interpreting the patent were in conflict, and who are now willing to accept their lamps from the complainants upon reasonable terms, have much stronger equities than the manufacturing infringers. These equities the court will not disregard, but what would be reasonable terms, if an application were made to the court in behalf of these cases, is a question which can only be determined in each case upon its peculiar circumstances."

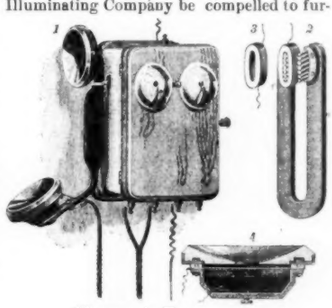
This language was used with reference to the condition of the electric lighting business, which was then being pressed upon the attention of the court, in which the owner of the patent, being a lamp manufacturer, had the ability to supply the patented lamps to users who had previously supplied themselves with electric lighting plants from the infringers. The court was not speaking of cases in which the Light Company had by its contracts precluded itself from supplying lamps in a particular territory to any person or corporation except its own exclusive licensees. It was not discussing the equities as between an illuminating company which was the exclusive licensee of the Light Company, and an infringing competitor upon the territory of the licensee. In such a case the remarks of the court in the Sawyer-Man case, with reference to the alleged equities of manufacturing infringing corporations, which were competitors of the Edison companies, are quite applicable. An illuminating company, the exclusive licensee of the Edison Company, which has made a large pecuniary investment upon its confidence in the strength and validity of the patent and in the ultimate success of the litigation in which its life was at stake, and has made an enormous outlay in the attempt to render incandescent lighting successful upon a large scale, has an imposing equity to protection by the courts, as against a competing infringer who has sold and used the very lamps which have been declared, as the result of an expensive litigation, to be the exclusive property of the owner and licensee. In such a case, the equitable owner of the patent is entitled to protection at the hands of a court of equity, provided too great pecuniary injury is not thereby visited upon the infringer. It is by no means the duty of a court of equity to cause an infringer, who is a user, to suffer a pecuniary calamity which ruins him and is far out of proportion to the benefit which the owner of the patent would otherwise be entitled to receive.

The strength of the defendants' case lies in the alleged extent of injury which they would suffer from an entire stoppage of the supply of incandescent lamps. It is insisted by their counsel that they would be ruined, and thus an immense pecuniary loss would be caused.

This result is not absolutely certain. Similar unfulfilled prophecies have been made before in the progress of this litigation. It is not certain that new infringing lamps may not be used which can be partially successful, but we have a well grounded fear that an absolute inability to obtain any Edison lamps for any portion of the business heretofore conducted by the defendants, will create a pecuniary injury so extensive as to be inequitable.

Turning to the consideration of the modifications of the orders which may properly be made.

The defendants ask for an absolute reversal and that they be permitted to use the Edison lamps, not only for their present, but also for their future incandescent business, the only restriction being that they pay a reasonable price therefor. They desire that the Illuminating Company be compelled to furnish lamps to which it has an exclusive right, and that by their use the defendants shall be enabled to extend their competitive business as widely as their capacity and enterprise will permit.



NORIEGA'S TELEPHONE.

The affidavits of Mr. Brown for the defendant companies say that a very large proportion of the investment of each company is for the purpose of taking advantage of future business, that the stations of each company are very much larger than the present requirements of the business demand, that each has one unused station which was constructed for the purpose of meeting future demands, that many miles of the ducts which each has leased, are unoccupied, having been leased by the defendants to accommodate the growth of their business, and that the cables which they have constructed have a greater carrying capacity than the present requirements of the business demand in order to meet future needs. He further says that no effort has been made for the past two or three years, by either of them, to extend their business. The growth has been due to unsolicited application.

The defendants, in desiring to obtain an unlimited future capacity of ownership of the patented lamps for the purpose of extending their competitive power, are asking too much. We perceive no controlling equity which should cause us to compel the illuminating company, which owns an equitable title to the lamp patent, to sell lamps to a competitor, for the purpose of enabling it to utilize the unused portion of its plant and extend its business into unoccupied territory, and thus permit it to deprive the owner of all the material benefit of the patent during the comparatively brief residue of his life. Neither is their a controlling equity which requires a court to permit the defendants to use the complainants' patent in buildings which have been lighted by either of them since July 14, 1891, the date of the decision by the Circuit Court in the test suit. At that time the defendants knew that the validity of the patent had been declared by a Federal Court in the district in which they lived. Ignorance in regard to the character and meaning of the patent then, in a measure, ceased to exist. They presumably knew that the owner of the legal title had parted with its equitable rights to the use of the patented lamps upon the territory which they were occupying to a rival lighting company, and that the licensee was not a manufacturer. From that date the defendants knew that they were in danger of being ultimately declared infringers, and that desired privileges must be obtained, not from the manufacturer, but from a competitive user of the patent.

Let the preliminary injunctions already granted by the Circuit Court be modified so as to enjoin each defendant against the use of infringing lamps in any building or place not now lighted by either of them, or not lighted by them respectively prior to July 14, 1891, with liberty to the complainants to renew the motion if, in their judgment, the defendants refuse upon reasonable terms and for reasonable prices, to pay for patented lamps in buildings in which the use of such lamps is not enjoined.

The orders should also require each of the defendants to file, within a specified time, with the clerk of the Circuit Court, a list of the buildings then lighted by them respectively, which were not thus lighted prior to July 14, 1891.

That portion of the orders of the Circuit Court which directed preliminary injunctions is sustained without costs to either party, but the cases are remanded to that court with instructions to modify its orders in the manner and to the extent hereinbefore stated.

Charles E. Mitchell and Eugene H. Lewis for the complainants; Benj. H. Bristow and Paul D. Cravath for the defendants.

Noriega's Telephone.

For some years past Mr. Eloy Noriega, a Spanish gentleman, residing in the city of Mexico, Mex., has been devoting a great deal of attention to electrical inventions, especially to the microphone and telephone. An interesting collection of these instruments was shown at the World's Columbian Exposition, Chicago, where they attracted much attention. From these we have selected for illustration one of the simpler forms, which is a practical and useful telephone, according to the *Scientific American*, to which we are indebted for the picture and these particulars.

Fig. 1 of the engraving shows the instrument completed, arranged for practical use; Fig. 2 is a perspective view of the receiver magnet detached from the telephone; Fig. 3 is a perspective view of one of the receiver coils; and Fig. 4 is a section of the transmitter.

In the box containing the magneto call is placed the induction coil, the telephone switch, and the transmitter and receiver are connected up in the usual way. A flexible cord carries wires for both receiver and transmitter. As will be noticed by reference to the engraving, the receiver and transmitter are both secured to an adjustable handle, so that while the receiver is at the ear, the transmitter will be in convenient position for receiving speech. The peculiarity of the transmitter is the device by which the necessary variable contact is secured. Behind the diaphragm is placed a layer of carbon filaments, similar to those used in incandescent lamps. This layer of filaments is backed up by an adjustable carbon plate. The diaphragm forms a part of the circuit, and when sounds are uttered in the vicinity of the diaphragm, the vibrations of the diaphragm alternately compress and release the carbon filaments, thus changing the conductivity of the transmitter and producing the variations in the primary circuit necessary to the transmission of speech.

The receiver is provided with a U magnet, with pole pieces extending from its sides, the pole pieces being formed of series of studs of different diameter. Upon each pole piece is placed a coil, the two coils being connected up in the line circuit in the usual way.

Another Lamp Injunction Asked For.

The Edison Electric Light Company has asked Judge Shipman for a temporary injunction restraining the Waring Electric Company, of Manchester, Conn., from manufacturing incandescent lamps on the plea that the Novak lamp infringes the Edison patents. Accompanying their bill of complaint they give the report of experts at the Edison factory who have examined the Waring lamps, and also relate the experiences of agents of the General Electric Company who have been sent to Manchester to secure evidence against the Waring Company. The hearing on the temporary injunction is assigned for next month. The Waring Electric Company engaged in the manufacture of the Novak lamp with the firm belief, based upon the opinion of eminent experts, that their lamps did not and do not infringe Edison's patents. They still hold to this belief.

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Electricity, the all conquering element of power, now proceeds to do up the canal mule.

Harold P. Brown, of electrocution fame, writes to the dailies of an improved car fender. We have missed Harold, but he is evidently still with us.

We think the gossip mongers who are consolidating General Electric and Westinghouse have struck an unproductive lead. There is nothing in it.

In Brooklyn objection is raised to the trolley cars because of their noiselessness. A few months ago the cars were too noisy! Consistency thou art still a jewel in Brooklyn as elsewhere.

The business situation is so much better than it was a short time ago that the electrical industry has taken on a much more cheerful appearance. The revival of trade came too late, however, to have any great effect on Fall business, but we all look forward to a brisk trade about the first of the year.

We continue in this issue Mr. Luther Stieringer's very interesting and instructive paper on the development of the art of fixture making and decorative illumination. Mr. Stieringer has a reputation second to none as a lighting engineer, and he has crystallized much of his learning and long experience in this paper.

We publish in this issue an article by Messrs. Ries and Scott, describing their new alternating current motor. The authors regret that they "are not yet at liberty to illustrate for publication the details of construction of this motor, but we think that the ideal results obtained from the same justify us in publishing the article at this time." We think, nevertheless, that the results of Messrs. Ries' and Scott's experiments will be interesting to our readers, especially in view of the attention now being paid to low frequencies and multiphase currents.

SHALL ELEVATED ROADS ADOPT ELECTRICITY?

It seems to be a pretty general sentiment that the electrical display at the World's Fair was a dampener of hopes of generic novelties. There were few notably new things to be seen, though, taken as a whole, Electricity Building teemed with magnificent examples of the progress and perfection of our great art, which have been, in the history of even this wonderful nineteenth century, unprecedented. Truly the growth of this now giant helper of man has no parallel in all the centuries which are now culminating in the grandest burst of improvement and invention. One reflects as he mentally recalls the various leading and more striking electrical features of the exposition, and compares what he now reviews with what he may have seen at the Centennial in 1876. He remembers a few little power generators, whose armatures timidly rotated in their imperfect fields, and an arc lamp or two, fitfully shooting their rays abroad; a few telegraphic and kindred inventions and a swarm of minor devices, such as batteries, call-bells, push-buttons, etc.

But the seed was sown, and the timid song of those armatures has in a quarter of a century swelled into the roar and thunder of a million generators and motors, and presents a tribute to the mechanical genius of man such as never was known. In every civilized quarter of the globe electricity is doing its turn, taking its share of the burden of labor, and is fast crowding out the more cumbersome and costly processes of generating and applying power.

But with all the glories of the electrical department proper before one, there was an electrical display within the grounds which was more striking to a New Yorker than all the rest combined. It was the Intramural Railway, and it was the most powerful and penetrating lesson to be learned.

Here was a veritable elevated railway, threading the labyrinth of the White City, turning all sorts of corners, and, more astonishing still, with ridiculously small loops at both ends, reverse curves and severe grades. And yet over all this difficult route four, five and even six car trains were regularly hauled by single electric motors. No dust, no coughing or brain-racking exhaust nozzles, no cinders, no rattling of connecting rods, no trouble or annoyance of any kind. And withal frequent stops were made and between them high speeds attained wherever the route permitted.

All the numerous difficulties of railroading were presented, and the daring electric motor easily surmounted them all. Not this alone, but we boldly assert that on the car mile basis the coal consumption was a trifle in comparison to that of the New York elevated locomotives.

It was a lesson that ought to be taken to heart by the management of our hitherto progressive elevated roads. It is true, they did, a few years ago, make some room for experimental trials, but these were made in the misleading light of imperfect methods, which to-day would not be attempted even by the experimenters themselves without introducing later ideas. There is no room for doubt that, if now attempted by one of the motor manufacturing companies, a complete commercial success would follow for the elevated railways of this city. Once installed in operation the direct saving would be a large item.

Not only would the coal bill be enormously reduced, but that for skilled firemen also. No change would be necessary in the structure save the laying of the electric conductor. The locomotives would be abandoned, and could be sold gradually at good prices.

With a few well-designed power houses, containing the best type of large stationary engines and economical steam generators, with modern coal and ash handling machinery, the power item of operating expense would necessarily come down very considerably. A material reduction in cost of skilled labor would be effected. And, better than all, the present features of annoyance to patrons of the road, pedestrians on the streets and tenants of abutting property would be absolutely eliminated in every respect, except the unavoidable roar of the trains on the track.

By equipping the road in properly proportioned sections and controlling devices, it could easily be made impossible for one train to run into another ahead of it, and thus the headway could be brought to a minimum. This alone would greatly increase the carrying capacity of the road. A further increase would arise in the prompter and surer starts from stations. The steam piston will not move the wheels until a certain opening of the throttle is reached. Few engineers can quickly tell this point, and they usually open the throttle too far, the result for a few seconds being a futile slipping of the wheels without advancing the train. Thus valuable seconds are lost, and in the course of a day many a possible train mile is lost to the management, and its earnings to the stockholders.

We shall refer to this subject again, in the hope that our elevated railroad management may be brought to accept the helping hand now confidently extended by this *fin de siècle* giant, Electricity.

LETTERS FROM A LABORATORY.—LXXII.

BY JULIAN A. MOSES.

A wise man once said: "That of books there is no end." This statement of the absence of a termination is not only applicable to books. The constantly increasing needs of our advancing civilization require continual additions in facilities from all sources. But of even the best of things we can tire. The most expensive delicacies pall on an educated taste, and it must be said that the readers of the literature of to-day have an educated taste.

Another sage individual once remarked that: "Variety is the spice of life," and again, it must be said that in this high pressure life of ours, nothing so relieves the mind and body as a distinct and continued variety in mental and physical occupation. No matter how solid or how frivolous the reading matter, the mind will become weary and we long to seek for new pastures. Departures from the regular ruts in which we sometimes travel are not always met with the appreciation they deserve. A departure shows an attempt for the better; it shows a spirit of progress which should be cultivated.

Notes of hearty appreciation from many readers of the ELECTRICAL REVIEW have been received by me, and have given a certain stimulus and added increased zest to the pleasure derived from writing these letters, but we long for something different for a time. Our literary palate desires to taste of new foods, and these letters from a laboratory will now be interrupted to give place to other matters electrical by the same author.

It has been my aim, and so will I continue, to allow the theoretical to give way to the severely practical. Nothing appeals more strongly to the American public than facts which have a ring of possibility and which sound as results of experiments, which if they are interpreted properly, cannot fail to be of general interest.

We are attracted much more to the solidity of the practical than to the ofttimes flimsiness and uncertainty of the theoretical, so it is a source of gratification to know that some experimenters have reaped some little benefit from the publication of these letters. But, now for a change. Matters of practical interest in another line of work will be dwelt on, and it is to be hoped that they will meet with the same general favor in the future as these Letters from a Laboratory have in the past.

It is very pleasant to feel the public pulse, and letters from readers are always appreciated. With this seventy-second letter we make an interruption, and say *au revoir*.

CORRESPONDENCE.

OUR NEW ENGLAND LETTER.

Pennock Primary Battery.—I notice that the well known and indomitable boomer, Geo. B. Pennock, is about to open another campaign against the innocent and unsuspecting citizens of this cultured town, and unless checked by a strong hand, will doubtless find many victims waiting to put their hard earned dollars into his most plausible and captivating schemes.

It was the general opinion of those in a position to judge, that Boston had already been worked to the utmost, and that when some months ago Mr. Pennock folded his tent, and like the Arab, silently stole away, it was to seek new fields in which to graze, and other communities more ready to jump at his tempting but expensive bait.

Either these opinions were not well grounded or the memories of past harvests gathered here have proved more fascinating than the prospects abroad. Certain it is that he has returned, and will take up business at the old stand and carry it on in the old way.

In passing through Exchange Place to-day I noticed that the windows No. 22 were occupied by a network of wires, and contained a notice to all pedestrians that the most wonderful exhibition of the age would soon be open to the public.

The mysterious generator which supplies current to the aforesaid wires was in plain sight within, and preparations were evidently under way to startle and amaze the people, and establish an acquaintance between the pockets of the visitors and the proprietor which should testify to the warmth of their regard.

That the current supplied by this generator is direct, rather than alternating—direct from their pocket into his—there can be no doubt, and it is this quality which recommends it so strongly to the inventor.

After expatiating in glowing terms upon the colossal fortunes waiting to be picked up by any one having sufficient confidence in this electrical wizard to follow his advice in the investment of their capital, he points out that the stock of the Pennock Electric Light and Street Railway Systems, of which he is president and general manager, offers a sure and quick road to the desired end, and states that a limited amount of this gilt edge security can be obtained by the ridiculously small expenditure of $25 per share.

That this offer is made solely in the interests of the deserving general public no one can venture to doubt for a moment, especially as several plain statements as to how the business is conducted are presented for consideration.

Among these, and probably the most reasonable of the lot, is one that throws open and completely revolutionizes the field of electric lighting. It is shown by abundant figures, and in the simplest of language, that stockholders in an electric lighting company whose plant cost $10,000, would have a net yearly income of $26,000 to divide among themselves, over and above all expenses of any kind whatsoever, and merely as a gentle clutch upon the too rapid accumulation of wealth, it is suggested that a sinking fund of $6,000 per year could easily be set aside to provide against contingencies. Think of it! Who can offer an excuse for continued poverty with such an opportunity at hand? There is only one point on which Mr. Pennock has displayed poor judgment, and that is in the matter of the locality he has selected as the font of this fountain of benevolence. Exchange Place is one of the narrowest of Boston's historically narrow streets, and it is feared the crowds of would-be investors who are eager to give up their paltry $25 for the privilege of sharing in the division of that $26,000 per year, will risk life and limb in their frantic efforts to reach the door way of this modern philanthropist. November 20 is destined to prove a landmark in Boston's history. I shall mingle early with the throng, and if I survive the issue you shall hear more anon. H. G. T.

Boston, November 18.

OUR WESTERN LETTER.

The many friends of Mr. E. B. Chandler will sympathize with him in the loss of his wife, whose death occurred last week.

Mr. H. L. Wills will read a paper on "Use and Abuse of Dynamos and Motors" before the Chicago Electrical Association, on Tuesday evening, November 21.

The Western Electric Company have sold the forked lightning column of incandescent lamps that attracted so much attention at the World's Fair, to John Wanamaker, of Philadelphia, and it will be erected in his mammoth retail store.

Prof. W. M. Stine, director of the department of electricity of the Armour Institute, Chicago, is receiving visits from parties interested in the important work that is being planned, and which gives promise of high results in the near future.

Mr. E. W. Goldschmidt, of the Western Electric Company, Chicago, leaves for San Francisco to prepare the exhibit of the Western Electric Company at the midwinter exposition. Mr. Goldschmidt will take four men with him, and secure a number of others on his arrival in San Francisco.

The Scenic Theatre.—Visitors to the midwinter exposition in San Francisco may enjoy the pleasure of viewing the wonderful changes in illuminating effects in the model scenic theatre, erected and operated at the World's Fair by the Western Electric Company, as it is now being packed up for shipment to the coast.

An Electric Carriage.—The correspondent seeking for information in last week's ELECTRICAL REVIEW relative to a practical electric tricycle, or carriage, driven by a motor supplied with current from a storage battery, may obtain full particulars regarding the method and cost of operation, by addressing Mr. B. J. Arnold, "The Rookery," Chicago, the inventor and manufacturer of a vehicle of this description.

The World's Fair.—The only arc lamps now in operation on the grounds or in the buildings, belong to the Standard Electric Company, Chicago, and four Standard dynamos supply current to the day circuits and 16 to the night circuits. The Standard Company has won the high record of having its 22 dynamos in operation from the opening to the closing of the fair without an accident or a moment's delay.

Consulting Engineers.—A model announcement, thoroughly practical in character, concise in wording, rich in typography and illustration, and one that might well be adopted as a model by other consulting engineers, is being mailed to interested parties by Mr. B. J. Arnold, from his office in "The Rookery." There are 13 illustrations from photographic views of railway power stations designed and installed by him, and also a partial list of the more important properties reported upon.

The Railway Ticket Exchange.—The lower floor of the new Marquette building, corner of Adams and Dearborn streets, Chicago, will be divided into offices for occupancy by the city ticket agents of prominent railway lines, thus facilitating the rapid interchange of business. To save loss of time, a simple but comprehensive system of telephone and speaking tube calls will be in operation, together with an electric carrier system that will automatically convey tickets and cash from one office to another. One office will be devoted entirely to telephone, telegraph and district messenger service.

Chicago, November 18. F. DE L.

OUR CANADIAN LETTER.

Preston, Ont.—Mr. Robert Walker, of the Del Monte Hotel, is about to put in an electric light plant.

Buckingham, Que.—The council will borrow the sum of $25,000 to complete the water works and electric light projects.

Bracebridge, Ont.—A by-law was carried, last week, by the rate payers, authorizing the council to issue debentures to the amount of $25,000 to cover cost of installing an electric light plant.

London, Ont.—Tenders are being received at the office of A. Armsby Graydon, city engineer, for an arc electric light plant for this city, including boilers, engines, etc. Plans and specifications can be seen at the city engineer's office.

Montreal, Que.—The electric railway committee of the city council has reported in favor of granting the Belt Line Railway Company permission to erect an elevated road on Delorimier avenue, Ontario, St. Catharine, Craig and St. James streets. Work to be commenced before June 1st, 1894. J. A. C.

Montreal, Nov. 17.

Suit on World's Fair Incandescent Lighting.

A suit has just been brought in the United States Circuit Court for the Southern District of New York by the Edison Electric Light Company against the New York Insulated Wire Company, and the Westinghouse Electric and Manufacturing Company, for infringement of the Edison feeder and main fundamental patent, which, it is alleged, was made use of in the World's Fair installation.

National Electric Light Association.

A meeting of the Executive Committee of the National Electric Light Association, to determine the next place for holding the convention, will occur at the Lafayette Hotel, Philadelphia, at four o'clock, P. M., Friday, November 24. The New York delegation to this committee meeting will gather at the office of the Association, 136 Liberty street, at one o'clock, P. M., on the date named and proceed together to Philadelphia.

Wall Street and the Electrical Stock Market.

The market during the week under review continued in its narrow professional rut, with spasmodic rallies and subsequent declines. Beyond a little inquiry from London for stocks with an international market, there was no buying of any moment. The bears demonstrated that they were in control up to a certain limit, and within this limit had things about their own way. However, they were afraid to sell too freely, and each deline of one or two points was followed by a reaction. The market was almost wholly within the Stock Exchange.

We make the prediction in our last report that there was nothing in the situation which would cause it to change for the better. This was verified. As for the future, opinion is about equally divided, with perhaps a leaning towards a rally. One is long overdue, while conditions are gradually growing a little more favorable.

The bear cards of the week were the rumors of trouble in the Bank of England, the assignment of the Thurber-Whyland Company, the continued decrease in railroad earnings, weakness in wheat and other produce, tariff legislation and stagnation in the various trades. Regarding the first rumor, little could be said beyond the statement that it was largely a scare. The Thurber-Whyland Company's assignment was not caused by present conditions, but by the state of affairs two months ago. The liquidation had already taken place, and the assignment is the first step in the reorganization. The other bear conditions, barring the tariff legislation, have already been discounted. Regarding the tariff, little can be said of a definite nature. In view of the returns at the last election and the growing sentiment of the people against a radical change in certain products, and the necessities of the government for more revenue, the opinion is crystallizing that there will be no radical or unjust change reported by the Ways and Means Committee. The bank statement was undeniably bad. While showing an increase of $7,641,750 in the surplus reserve to $65,470,475 above legal requirements, loans decreased $1,253,200, showing that there is no commercial demand for money.

As bull arguments for an advance in stocks may be cited a good short interest in the market, a decline of some six points on the present movement, rapidly increasing money reserves in commercial centers, the payment by Burlington of its full quarterly dividend, and the demand on the part of capitalists for gilt edged bonds. It is the nature of money to earn interest, and it is almost certain that the present accumulation in banks and Trust companies will not continue much longer. This tendency has already been reflected in an excellent demand for gilt edged four and five per cent. railroad bonds.

We believe that the market of the Winter will be a discriminating one, and that those stocks which are entitled to higher quotations will advance, while those which are already too high, either through artificial support or that they are not able to continue dividends, will decline.

The electrical stock market furnished two stocks which were features of the week's transaction, viz., Western Union and General Electric. They were both subjected to strong bear attacks and both yielded, leading the market in point of decline. There was little feature outside of these.

Concerning General Electric, there has been much speculation owing to the slump on Thursday from 42 to 38. It was accompanied by all sorts of rumors regarding the condition of the property. One was to the effect that there has recently been an expert examination of the books of the company in the interests of certain holders, which resulted in unfavorable developments. Another, that the company had lost a considerable sum in connection with the Intramural Railroad at the World's Fair. Still another, that Mr. D. O. Mills, one of the directors, was identified with the Cataract Construction Company, which had recently let a big contract to Westinghouse, and that he intended to resign his General Electric office. The selling was started by Mr. Van Emburg, followed by Wales & Company, Bainchi Harding and others. It will be remembered that last week we called attention to the fact that 40 for a non-dividend paying stock, which has no immediate prospects of paying a dividend, was too high. We believe that the break was the result of a bear raid made for the purpose of facilitating the covering of shorts in certain of the active stocks. It was most natural that the bears should pick out as an object of attack, a 40 per cent. stock which is not paying dividends and concerning which so much has been said and so little is known. Judging from the outpouring of stock, after the decline had started, it looked as if certain holders had been holding on waiting for an advance in the market on which to get out, and that they took fright with the result as shown. The volume of business is about 50 per cent. of that of a year ago.

There are some very strong bull arguments in favor of General Electric. There was noticed some good support at the decline, and the rally of a point to 1⅛ was sharp. Mr. D. O. Mills said that he would not resign from the directorate of the company. The company has recently secured some contracts which should be profitable. Besides the contract with the People's and Electric Traction Company, Philadelphia, for motor and car equipment, amounting to something like $2,000,000, it has secured a contract for generators from the Electric Traction Company. It is said that the affairs of the company have been put in such shape that it is no longer losing money, and has closed all works not absolutely necessary for its business. Some of the directors have taken upon themselves the company's supervision and management. It is hardly likely that dividends will be resumed until there is an improvement in the general business situation. It is doing business on a cash basis only, and consequently its revenue is not tied up in slow assets.

Western Union was the object of bear attack, going from 88¼ on Tuesday, to 85⅞ Friday, after which there was a rally. It is believed that long stock was sold on the decline, which was accompanied by the rumor that the dividend in the March quarter will be reduced. Well posted capitalists have it that there has been some decrease in earnings, but that this has been offset by decrease in expenses, and that the dividend will be continued at the present rate. It is history that the Western Union has always suffered more in the year or two after a panic than in a panic year. In this connection as having a possible bearing on its business in 1894, the following table which shows the gross earnings per mile, and cables, and the net profit on each message for a series of years will be presented.

It will be noticed that the panic of 1873 was reflected in the gross earnings per mile of 1874, there being a drop of $12 in that year. There was no corresponding decrease in expenses, the falling off in business being apparently too rapid to be immediately met. From that point there was a gradual recovery, partly due to increased earnings, and partly to decreased expenses up to 1876. Then, there was a drop of $15 in two years on the gross per mile, a part of which was offset by decreased expenses. From this point occurred the jump which represents the period of gigantic railroad construction and high prices, and in two years, the gross revenue per mile increased $28, the net profit per message remaining stationary. The drop in 1881 represented increasing territory as did the years 1882 and 1883, at which stage there was a pause in construction which lasted till 1886. The depression between 1884 and 1886 therefore represents the effects of the panic of 1884. From 1886, new construction was again carried on largely, but the recovery begun in 1885, was reflected in the advance from $107 in 1886 to $115 in 1888. From 1888 to 1890, new construction was fair, but business kept up with it. Since 1890, construction has been almost stationary, and the gradual recovery to $131 per mile in 1893 represents improved business. The position in this year is apparently analogous to that in 1873 and 1884. In 1873 there was comparatively little new construction work in hand, and in 1884 there was practically none. Yet in the year following each of these panic years there was a large drop in the business.

Under the circumstances it would not be surprising if the revenue per mile showed a falling off in 1894

New York, November 18.

PERSONAL.

Col. E. L. Babcock, of the Falls Rivet and Machine Company, Cuyahoga Falls, Ohio, was in New York last week.

Mr. Eugene F. Phillips, president of the American Electrical Works, Providence, R. I., was in New York the other day and called on several of his friends by telephone.

Mr. Walter C. McKinlock, secretary of the Metropolitan Electric Company, Chicago, has been confined to his house for some time on account of illness, but is again at work.

Mr. H. C. Marillier, the editor and "Meteor" of our brilliant British contemporary, *Lightning*, recently resigned from that journal to go into general newspaper work in London, where he is rapidly gaining fame.

Hon. Gardiner C. Sims, of the Armington & Sims Engine Company, Providence, R. I., was in New York last week inspecting the Brazilian cruisers, "El Cid" and "Brittania," on which his company placed the Armington & Sims engines and the Sims Edison torpedoes.

District-Attorney Nicoll has announced that the personal charges against Mr. R. T. McDonald, a director in the Madison Square Bank, of New York, have been dismissed. The official conduct of all the directors of the bank, which is now in the hands of receivers, will be investigated.

Some Recent Developments in Alternating Current Motors.

BY ELIAS E. RIES AND GORDON J. SCOTT.

Among the most interesting and valuable features that characterized the work of the International Electrical Congress, recently held in connection with the World's Fair at Chicago, were the remarks made by many of the distinguished delegates present upon the subject of the transmission of alternating currents and the respective merits of single and multiphase motors for power distribution. Although opinions were somewhat divided upon this latter question, it was clearly recognized that the multiphase systems at present available were merely an expedient rendered necessary by the existing state of the art, and that the advent of a simple and efficient self-starting single phase alternating current motor would at once establish the latter as the standard type for nearly all classes of electrical power distribution.

In the course of some extended experiments made by us upon the subject recently, we have discovered and practically demonstrated a number of important facts which in many respects revolutionize the theories that electricians have heretofore held, and have been accustomed to regard as essential principles in the design and construction of alternating current motors. These discoveries, which promise to inaugurate a new departure in alternating motor construction, have shown us that it is not only possible to construct self-starting non-synchronous alternating current motors of any desired power, that will run economically on single phase circuits of any commercial frequency (such, for example, as that in common use for incandescent lighting), but that such motors will be, everything considered, far more efficient, both electrically and mechanically, than the best continuous current motors yet produced.

The difficulties hitherto encountered in attemps made to construct self-starting, variable speed motors intended for operation on ordinary alternating current incandescent lighting circuits, have apparently been of an insurmountable nature. With the exception of the smaller types of motors developing a fraction of a horse-power, such as those used for operating small ventilating fans, where economy in the use of current has been consider of minor importance, and in which the self-induction in the energizing coils and t e losses in the magnetic circuit could be kept reasonably small, all attempts to produce efficient motors to operate on a simple two-wire alternating circuit, without the employment of more or less complicated auxiliary starting or lag-changing devices, have thus far failed. Even two phase and polyphase motors, as at present constructed, although self-starting under light loads, require for their efficient operation not only a low frequency that unnecessarily increases the size of the generating, transforming and motor apparatus, and which renders it in many cases unsuitable for lighting purposes (to say nothing of the greater complexity of the feeding and distributing mains which such a system involves), but owing to the great sacrifice in electrical and mechanical efficiency when their normal speed is departed from, such motors cannot compete with direct-current motors for work where a variable speed with maximum torque is requisite, as, for example, in the case of electric street railways.

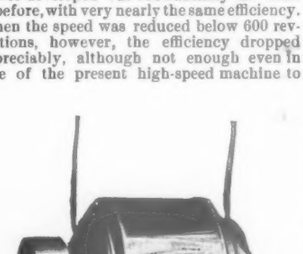
Following up our researches in the alternating motor field, and with the view of producing a motor of simple construction that could be operated on any of the commercial alternating current circuits now in use, with reasonable economy, we built a number of experimental motors of various types and sizes embodying some of the results of our investigations. These motors have been thoroughly tested in the factory of the Ries Electric Specialty Company, at Baltimore, Md., and the results obtained have been so successful that we are now making preparations to build alternating current motors for commercial uses that, in the matter of efficiency, simplicity, weight, adaptability and general excellence of operation, will compare favorably with, if, indeed, they do not in these respects surpass, all existing types of electric motors.

Believing that the remarkable results we have already obtained will be of general interest at this time, we have thought it advisable to present herewith a photograph of one of the single phase motors built and used by us in some of our experiments, together with such information concerning its operation as we are at liberty to disclose at present.

The motor illustrated has a capacity of one horse-power and was designed for and tested upon an ordinary 50 volt alternating current incandescent light circuit having a frequency of 138 complete cycles per second. The most noticeable feature is its extremely small size and weight for a motor of its output and efficiency. The total height of this motor, including base, is 9½ inches, the diameter of the motor proper, 9 inches; the width of motor, exclusive of end plates containing bearings, 5 inches; the total length of armature shaft, 11½ inches; while the total weight is but 35 pounds, of which only two pounds are copper.

Actual brake measurements were made upon this motor, while the same was running at various speeds on an ordinary 50 volt incandescent circuit of 138 complete cycles per second. At a speed of 2,000 revolutions per minute, taking 15 amperes of current, the motor developed 26,400 foot pounds, or .80 horse-power, at an electrical efficiency of 90 per cent., the motor remaining perfectly cool after a continuous run of eight hours. With 10 amperes of current the power developed was 17,850 foot pounds, or .54 horse-power, with an electrical efficiency of 93 per cent.

On increasing the load on the motor and thus reducing the speed to about 1,000 revolutions with the same flow of current, the power developed was substantially the same as before, with very nearly the same efficiency. When the speed was reduced below 600 revolutions, however, the efficiency dropped appreciably, although not enough even in case of the present high-speed machine to



THE RIES AND SCOTT ALTERNATING CURRENT MOTOR.

detract from it usefulness for continuous and effective work at speeds very much below those hitherto found practicable in direct current work.

The diameter of the driving pulley is five inches, yet, notwithstanding this, the torque developed by the motor is so great that it starts off promptly under full load. The speed of the motor, as has been fully demonstrated by these tests, is variable within wide limits and without appreciable loss in efficiency, a result that has not heretofore been obtainable either with direct or alternating current motors. Another and most valuable characteristic of one type of the motor under consideration is that with a given flow of current the torque increases, up to a certain point, as the speed decreases. This peculiarity is likewise entirely new and of the utmost importance, since it not only provides an exceedingly high starting torque, but enables the motor to develop its maximum power continuously at the highest possible efficiency and irrespective of the speed at which it may run.

It will at once be apparent that these features render this type of motor particularly applicable for all stationary and railway work where widely fluctuating loads are encountered, especially so because the principles underlying its construction are such that, unlike direct current constant potential motors, it cannot of itself receive more than its maximum normal current under any conditions of use, and thus cannot possibly be burned out or injured by an excessive overload, or by any of the other causes which have proven to be such prolific sources of trouble in the case of continuous current motors.

Perhaps the most remarkable feature about this machine is the fact that the losses and other difficulties that have heretofore attended the use of comparatively high frequencies for alternating motor work, whether single phase, two phase or polyphase, have been practically eliminated. Indeed, were it not for this discovery, the results here recorded could never have been obtained. It is, perhaps, not too much to say that this achievement, to which we have successfully directed our strongest efforts, will contribute largely to the adoption of higher and more economical frequencies for alternating current work than those at present in vogue, or, at least, to the maintainance of the highest of the standard periods now in commercial use on lighting circuits, thus deservedly checking the precipitate and ill-advised tendency, which is at present more or less prevalent, not only abroad, where multiphase systems have, for some time, been extensively used, but in this country as well, to adopt as a standard for general use a current of such a low frequency as would involve not only much larger and more expensive generators, transformers and motors, but which would prove unsatisfactory and uneconomical in the highest degree for nearly every purpose to which it can be applied.

Since high frequency in alternating current apparatus is the equivalent to high speed in direct current apparatus, in being the seat of the direct and counter electro-motive forces developed, and since it is well known that by increasing the speed of a direct current armature the output of the machine for a given amount of iron and copper is very much increased, it follows that the higher the frequency that can be used the better the results obtained from an alternating current motor of a given size and weight. While there are serious mechanical limitations to higher armature speeds than those now in use, there are, so far as the motor is concerned, no longer any restrictions to the use of higher frequencies, since the self-induction and hysteresis, which in all previous types of alternating current motors have been the principal sources of loss, are now for the first time utilized in our motor, and turned to practical account, as shown by the fact that the motor runs perfectly cool despite the small quantity of iron and copper in the machine. Thus, on circuits of higher frequencies the alternating current motor will possess not only an enormous advantage over its continuous current brother in the matter of safe and economical transmission over long distances of the power that gives it its vitality and scope, but wi) be far superior to it as a motor by reason of its more simple and compact form, and the correspondingly increased amount of power it is capable of generating per unit of weight under these conditions.

In addition to the experimental motor illustrated herewith, we have built other single phase motors of larger sizes that are now doing successful work in the factory of The Ries Electric Specialty Company, where they can be seen in operation. Some of these motors are designed for synchronous working and run at a constant speed under varying loads. As in the case of the variable speed motor, they are self-starting, and run rapidly up to synchronism without the use of a special starting coil or switch, and will automatically regain synchronism should their speed be temporarily reduced below it by reason of a heavy overload.

We are now able to predetermine the characteristics of our motors with as much accuracy as with direct current machines, and as already stated, we are rapidly completing the designs for a full line of these motors, ranging all the way from a small size one-eighth horse-power alternating current fan motor to the largest motors that may be required for stationary work. We have now likewise in course of construction a single phase high frequency alternating current railway motor of 40 horse-power capacity, which will have less than one-half the usual weight and will embody some novel features peculiar to itself that are likely to have an important bearing upon the future of the electric railway.

To those who have been accustomed to the behavior of direct or continuous current motors, or to those who have regarded the continuous current as the only practicable and economical one for power purposes, the remarkable performance of these motors and the simple manner in which these results are obtained, is little short of marvelous. The comparatively high frequency of the alternating current used, the adaptability of the motors to ordinary single phase circuits, the exceedingly small size and weight of the motors compared with direct current machines of similar capacity, the absolute reliability of their operation, the extremely slight internal losses in the machine to which their unusually high efficiency is largely due, and the great simplicity of their mechanical and electrical construction; in short, the radical departures made by us in the entire designs of these motors, regarding which we hope soon to be able to publish full details, causes these motors to excel in every respect all that has yet been accomplished by the continuous current motor, and far surpasses in its reality the most sanguine expectations of even the foremost advocates of the transmission of power by alternating currents.

BALTIMORE, MD., November 15.

The Gassner Element.

ITS ADVANTAGES IN TELEPHONIC WORK.

The readers of the ELECTRICAL REVIEW are aware that several attempts have lately been made to replace the Leclanché element, generally used as the source of current for microphones. It will be remembered that Messrs. Böse and Lütcke invented a secondary cell that was carefully tested by the German Postal and Telegraph Administration, and promised so well that orders were given to equip several telephone exchanges with it. For further particulars the reader is referred to our issue of May 13, 1893, p. 154, "The Use of Accumulators in Telephony." Meanwhile, numerous tests have been made with the Gassner dry battery in Germany, as current supply for microphones. In fact, since May, 1891, 5,000 of these cells have been in daily use, and it is stated that they surpass all other dry batteries so far tested by the administration. No diminution in loudness of transmitted sounds has been noticed, the batteries being in constant use from May, 1891, to the close of 1892. Based upon these tests, the experimenters assert that the life of the Gassner cell for telephonic purposes is, at least, 18 months, thereafter the cells can be utilized as call batteries. A single cell is amply sufficient to supply all the current necessary for a microphone, while it takes three zinc carbon elements to produce the same result.

The only drawback mentioned in the report, is the fact that the Gassner cell, having been in constant use during a long conversation requires some time to regain its former strength. For this reason the administration replaced some Gassners by fluid cells at subscribers' stations where they are in constant use from morning until night. It is also recommended to use fluid batteries at all stations that operate alarms by the dropping of an annunciator; in other words the short circuiting of the battery should be avoided as much as possible.

A number of dry batteries have also been tested to determine their efficiency as current supply for alarms. The result of a great number of experiments leads the writer of the above mentioned report to place the efficiency of the cell when used for calling purposes *only* as three years. Attention is called to the ease with which the working condition of the Gassner may be determined. If, after removing the telephone from its supporting hook, the diaphragm of the microphone is lightly touched by the finger, a distinct noise should be heard in the receiving telephone. The report concludes as follows:

"The use of the Gassner dry battery is a guarantee for the efficient work of the transmitter; on the other hand the life of the battery is longer (than that of the Leclanche), and this amounts to a considerable saving in the general operating expenses, such as are incurred by the removal, replacement, replenishing and cleaning of fluid cells. Moreover, neither porous pots nor battery jars can be broken. On account of the favorable results so far achieved, the administration has instructed the several principal Berlin telephone exchanges to employ dry batteries to a large extent both for telephonic and signaling purposes."

We would respectfully ask whether or not a good many of the zinc cylinders of the Gassner cells used in these tests have not been found to crack? Among one dozen Gassners which were required for general work in a private house, we are informed that not less than four had to be removed within six months on account of the above mentioned fault.

Electric Lighting in France.

Most of the little towns in France, which are not handicapped by concessions granted in former years to gas companies, are taking kindly to the electric light. Saint Geovie, a little town of only 2,000 inhabitants in the Department of Isère, has recently decided to establish a water power driven central electric lighting station. At Thôres, too, in the upper Savoy, another little village, a similar station, having a capacity of 250 horse-power, has recently been completed.

A Device For Signaling at Sea.

Recent trials of a device called a hydrograph, invented by Captain Neale, of England, for the purpose of signaling at sea or between ships and shore, have given results for which much practical importance is claimed. The invention is based upon the well known acoustic principle that if a musical note is sounded, an object normally tuned to emit a similar note will sympathetically respond to the exciting note if it be within reach of its vibrations. The apparatus consists of two instruments, a transmitter and a receiver, and the vibrations are conducted from one to the other by water alone.

At the trial mentioned, which took place on the Thames, the transmitter consisted of a bell 16 inches in diameter attached to the lower end of a framing, the bell being submerged about six feet in the water. At the upper end of the frame was a crank handle, by which a double beat hammer was worked. The receiver, which was stationed something less than a mile distant, consisted of a pair of metallic drums about 10 inches in diameter, open at one end and fixed, mouth to mouth, upon a piece of board. The drums were suspended in the water and connected up with a small battery and through it with a tape recorder. The Morse code of dots and dashes was used, a quarter turn of the crank giving dots and full turn dashes. In this way messages were transmitted very successfully, although slowly. In the future it is intended to strike the bell by an electric apparatus and likewise record the vibrations transmitted. At present the operator at the receiver hears the sound of the bell through an acoustic apparatus attached to the drums and records them on the tape by hand. Further experiments are now being made on the Solent, under the supervision of the Board of Trade.

It is claimed that this invention will do much toward preventing collisions at sea during fogs, it being proposed to fit sLips with both transmitting bells and receivers. It would be necessary, of course, that all of these bells be tuned to the same note. The *Safety Valve* doubts that such an instrument will or can take the place of a steam fog horn, for although it is possible that the bell might be heard as far as the horn, the tape-recorded sound could give but little, if any, idea of the distance of the transmitting bell, and it must utterly fail to show from what direction it came.

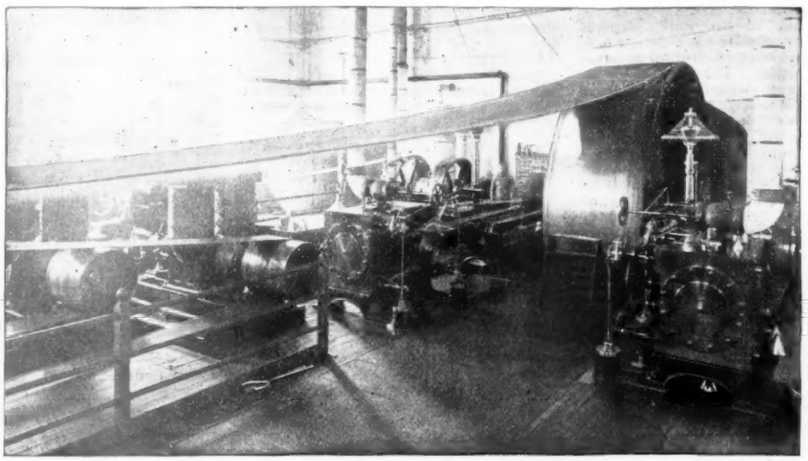


FIG. 1.—JEWELL BELT IN THE POWER STATION OF THE NEW JERSEY TRACTION COMPANY, JERSEY CITY, N. J.

She Could See No Horses.

Apropos of the electric carriage that has been seen several times of late in Prospect Park, a funny little incident is told. A nervous, overworked woman, who greatly dreads lest she shall suffer complete failure of some of her powers, was taken for a drive one afternoon last week by a relative.

They were rolling smoothly along in a luxurious Victoria when suddenly the hostess felt her arm clasped convulsively.

"Don't be frightened, Kitty," said her companion, and her voice was strained and startled. "I feel well, and don't believe I'm going to faint or anything—but something is the matter with me. I see things strangely. That carriage there appears to be moving along without horses or driver—it's all a blank to me in front of the dashboard—what do you suppose it can mean?"

And the relief which followed from her cousin's explanation was great.

Jewell Belting.

The rapid development of the electric lighting and railway interests has made necessary a corresponding progress in many accessories of electric plants. Among these is belting, something that will always be required in large quantities by the electrical industry in spite of the recent tendency toward large, direct coupled units. Among the prominent belt manufacturers who have carefully followed and supplied the requirements for a proper belting to be used in connection with electrical machinery is the Jewell Belting Company, of Hartford, Conn. Their success in supplying the right kind of belting is attested by the wide popularity now enjoyed by their "Dynamo" and "Railway Dynamo" brands, which are in use in many of the largest light and power plants in this country. All their belts for this class of work are made from the choicest selections of pure oak bark tanned, short lap leather. They employ the latest improved machinery in every department, and take advantage of each day's experience in their work to produce a belt that will give the most satisfactory results obtainable.

Several views of the interiors of stations using the Jewell belts are presented herewith. Fig. 1 shows a belt in the plant of the New Jersey Traction Company, at Jersey City, N. J. This belt runs from a driving pulley 217 inches in diameter to a driven pulley 72 inches in diameter, the distance between centers being 50 feet. At 90 revolutions per minute this belt transmits 700 horse-power, and the load is very changeable. Fig. 2 shows a large belt in the station of the Hudson Electric Light Company, at Hoboken, N. J. At Springfield, Mass., in the station of the United Electric Company, shown in Fig. 3, there is in operation a 44 inch Jewell belt, running on pulleys of 111 and 66 inches diameter, the distance between centers being 30 feet. The driving pulley runs at 200 revolutions per minute, and the belt has transmitted a maximum of 600 horse-power, the extremes of load being 200 and 600 horse-power.

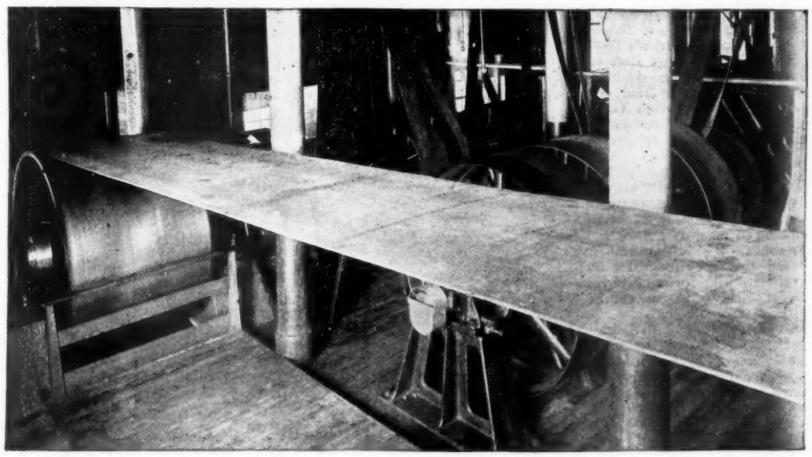


FIG. 2.—JEWELL BELT IN THE PLANT OF THE HUDSON ELECTRIC LIGHT COMPANY, HOBOKEN, N. J.

Electric Lighting in Germany.

The three central stations which Messrs. Siemens & Halske, of Berlin, have established in the town of Bremen, for the municipal authorities, have been completed and put in operation. Current is already being supplied to 20,000 lamps.

An installation of electric lighting is being carried out at the Victor Colliers, near Rauxel. The plant will be underground and water power will be utilized.

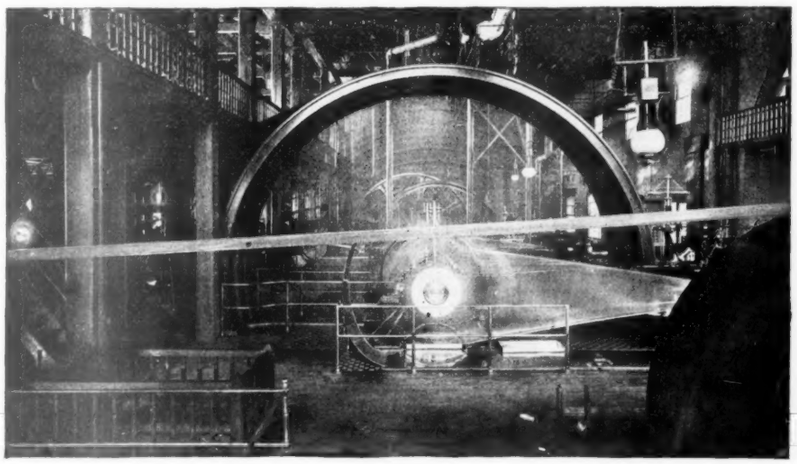


FIG. 3.—INTERIOR VIEW OF THE UNITED ELECTRIC COMPANY'S STATION AT SPRINGFIELD, MASS., SHOWING JEWELL BELTS.

"What Did He Know About Electricity?"

As near to recreation as anything of the kind ever engages the ever-earnest attention of Prof. Elihu Thomson, is the interest which he shows in the alleged applications of electricity, particularly in regard to the devices by which the unscrupulous play upon the credulous and the suffering. While at the Chicago Fair he examined at a selling stand a so-called electrical appliance to be worn in the shoes for the cure of various ailments from cold feet upwards. The young woman volubly described the apparatus in political phrase, "claiming everything," and then proceeded to explain the "scientific principles" by which the electric current would pass upone limb to the heart and then down by the other one, and much more of like ilk. The professor mildly stated that electricity did not operate in the manner as stated, when the young woman indignantly swept the goods back into the show case, indignantly exclaiming, "Well, what do you know about electricity, anyway?"

The Primary Action of the Galvanic Current.

IT INCREASES THE AMOUNT OF OZONE IN THE BLOOD AS SHOWN BY CHEMICAL TEST OF THE BLOOD IN THE ARTERIES—WITH A THEORY OF ANIMAL ELECTRICITY.

BY J. MOUNT BLEYER, M. D., AND M. MILTON WEILL, M. D., OF NEW YORK CITY.

[From the archives of the Smithsonian Institute.]

(*Continued from page 156.*)

PRELIMINARY TESTS.

For a period of 72 hours before entering upon the examinations, we hung in various portions of our laboratory slips of specially prepared paper, saturated with a solution of the iodide of starch, and others moistened with tinct. guiac. These, as we all know, are acknowledged tests upon ozone. We kept the papers under careful observation, examining them in strong light at intervals of an hour, and as there was no evidence of a reaction at the end of the allotted time, we were justified in concluding that the atmosphere of the laboratory was free from ozone and the other gases which act upon starch and guiac. Next we directed our attention to nitrous compounds in the air, for the reason that they—if they exist in the slightest appreciable quantity—give us a reaction very much like that of ozone, and their presence must be excluded in order to give any sensitive test for ozone practical chemical value.

The test we applied for nitrous compounds is an extremely useful one, unusually sensitive, and we give its chemistry for the benefit of those who may desire to repeat our experiments. It is named Gries's Test, after its discoverer. He observed that in sulphanilic acid and naphthylamine we have a re-agent which acts on nitrous acid, but not on H_2 O_2 or O_3. This discovery Gries made while engaged in studying the action of diazo-benzene-sulphonic acid on naphthylamine.

He obtained his diazo-benzene-sulphonic acid by treating sulphanilic acid with nitrous acid, and calls attention to the extreme delicacy of the reaction, minute traces of nitrous acid sufficing to produce a dark red color in the presence of dilute sulphuric acid. The colored substance formed is an amido-azo derivative of the formula C_6H_4 (So_3H) $N=N$ $C_{10}H_6NH_2$ called azo-amido-naphthalene-benzene-sulphonic acid.

Professor Slosvay, of the Polytechnic School at Buda-Pesth, increases the sensitiveness of the reaction by substituting acetic for sulphuric acid, and he can detect with it nitrous acid in aqueous solution in a dilution of one part nitrous acid to one thousand million parts of water.

The formula of the test is: C_6H_4 NH_2 (So_3H) $+C_{10}H_7NH_2+HNo_2=C_6H_4$ (So_3H) $N=NC_{10}H_6NH_2$ sulphanilic acid and naphthylamine.

We availed ourselves of Slosvay's modification of Gries's formula.

A tank of a capacity of 50 gallons at a pressure of 30 pounds was filled with air from the laboratory. The air was sent through an air meter which registered one litre per minute, and from this into a test tube containing distilled water, through which it was allowed to bubble for 10 minutes and then tested.

There was no immediate reaction, and only after half an hours' standing did we observe a tinge of color; so faint, however, as to be almost imperceptible in ordinary light. In order to see it, we were obliged to back the test tube with pure white filter paper and hold it in the sunlight.

In view of the delicacy of Slosvays' reaction, it was fair to assume that the quantity of nitrous acid in the air was so infinitesimally small that for practical purposes it could have no effect in interfering with the subsequent tests for ozone.

Ten litres of oxygen were treated in the same manner. The oxygen was first subjected to two washings in distilled water without giving any reaction to the nitrous acid test. The remaining 40 gallons, which were afterwards liberated in the laboratory, were washed in caustic soda and dried with sulphuric acid (C P) and bubbled through distilled water. There was no reaction with Gries's test, thus showing that the gas was absolutely pure and free from admixture with nitrous and other gases.

This concluded the preliminary testing. The object of the careful analyzing of the air of the laboratory, as you may already divine, was to devise means of testing for ozone in the open, and to avoid the less satisfactory method used by Schmitt, who treated his ozone in a balloon from which the oxygen had been removed as nearly as possible to do so, by means of carbon dioxide, or handling it in a similar glass receiver, from which all air had been exhausted, which was the manner in which Kühne conducted his experiments.

For several days work was suspended and resumed again Monday, August 21. On that morning we were treated to a genuine surprise that caused us to ponder for a while. Dr. J. C. Dittrich, who, perhaps, ranks first among the authorities on ozone in this country, and who kindly assisted us in the chemical portion of our work, prepared several specially sensitive test papers, which, on being moistened with distilled water, at once gave a reaction. The air of the laboratory was evidently charged with ozone, and we were at a loss to account for its presence. Speculation was soon set at rest when we recalled the violent thunder storms of the Sunday and Saturday before.

The ozone was the result of the intense static discharges of those days, and the amount that had been generated by the great Pluvius certainly was enormous and beyond measure. For that day, and the three succeeding ones, work had to be deferred, with all the preliminary testing for naught.

On the following Thursday, on resuming operation, no ozone or nitrous acid was detected in the laboratory. The preliminary tests, on being repeated, gave results as already stated.

TESTING FOR OZONE IN THE BLOOD.

A rabbit that had been well fed for a week was the subject of investigation—it was a big animal, in fine spirit, and weighed four pounds, three ounces. It was brought into the laboratory, and both carotids cut through and the blood collected in a sterilized glass receiver. In all, 60 grammes were extracted and defibrinated with sterilized glass rods. The operation requires nine minutes, and the fresh serum was subjected to test.

The serum was diluted with distilled water, in the proportion of one part of serum to four of water.

With the iodide of starch an immediate reaction was observed in the open air, and the same reaction, faint at first, but gradually deepening in blue color, showed under a bell glass.

Testing with guiac tincture of the officinal strength, which we reduced by adding an equal volume of absolute alcohol, responded more quickly to reaction of ozone. The blue ring around each drop of blood was marked and sharply defined. The same reaction continued when the test was made under the bell glass, and gradually approached its maximum of intensity at the end of half an hour, when, to all appearances, the ozone became completely exhausted.

The fibrinous clot, with the entrapped corpuscles, was likewise tested, and gave a far more distinct and marked reaction than the serum.

It was evident at a glance that the corpuscles contained a far larger amount of ozone than the plasma.

The remainder of the defibrinated blood, about 40 grammes, which had been kept in a well covered jar, was next subjected to electrification for five minutes.

A galvanic current of 10 volts and 15 mil. amperes was sent through the fluid. The electrodes used being strips of platinum an inch long and three-eighth inch wide.

In six seconds the meter dropped to eight mil. amperes, and the registration which was recorded at the end of each minute read as follows:

1 minute	 7	mil. amperes.
2 "	 5	"
3 "	..... 4.5	"
4 "	..... 3.75	"
5 "	..... 3+	"

Testing with iodide of starch and guiac tincture showed the unmistakably increase of ozone. The rings around the drops of blood were of deeply blue hue, and the reaction continued on with much greater rapidity than was the case of the unelectrified blood. As quantitative test was out of question, Dr. Dittrich and my colleague made an approximation of the intensity of the action by comparing the rapidly deepening ring of blue with the chromatic scale, given by Dr. Fox, in his exhaustive work on ozone. They carefully noted the change of color at it progressed, availing themselves of the most advantageous light facilities, and agreed upon the estimate that the amount of ozone adequate to such reaction must be in the neighborhood of, at the lowest calculation, at least two and one-half times greater than the amount indicated by the reaction in the case of the unelectrified blood. The clot deposited around the electrode at the positive pole gave a more animated reaction, the ring of blue almost approaching indigo, showing a most marked increase over the former reaction.

Standing by itself this test of the blood outside of the body signifies but little, for it is the blood that circulates through the living organism unimpeded with which we have to deal and in which physiological conditions alone can be of any value in the study of the action of the galvanic current. Yet, withal, when taken in connection with the tests that were afterwards made, the observations form an important link in the chain of evidence that it is animal electricity which is the polarizer of the atoms of neutral oxygen both in the plasma and in the haemoglobin.

Under normal conditions the transformation of O_2 into O_3 is slow and gradual, and the polarization of the neutral oxygen is proportionate to the polarizing force of the existing animal electricity.

(*To be continued.*)

THE PACKARD "MOGUL" LAMP.

The Packard "Mogul" Lamp.

The New York and Ohio Company, Warren, O., manufacturers of the well-known Packard incandescent lamps, have departed from the usual practice in this country, and are now making an incandescent lamp in sizes of 200, 300 and 500 candle-power, while other sizes up to 1,000 candle-power are in preparation and will soon be placed upon the market. This new high candle-power lamp is known as the "Mogul," and is shown in the illustration herewith. Among the important advantages claimed for it by the manufacturers are that it will give a more satisfactory illumination with the same expenditure of watts than an arc light run from an incandescent circuit, and that it is a perfect substitute for alternating current arc lamps, and will operate entirely free from the humming noise peculiar to alternating currents.

A special quality of carbon is used in the filament of the "Mogul," which is subjected to a gas treatment that produces a highly efficient lamp which maintains a nearly constant candle-power during its normal life. The efficiency claimed for the "Mogul" is two and one-half watts per candle power, thus giving nearly twice the light of ordinary lamps with the same engine and dynamo capacity.

These lamps are made in two classes, one of high efficiency, designated as "A," and the other of long durability, designated as "B." Running at the usual efficiency of the ordinary incandescent lamp, the life of the "Mogul" exceeds that of the ordinary lamp, but when used to light large areas, it has been found more economical to operate it at the higher standard.

In comparison with a group of small incandescent lamps, the cost of a "Mogul" is not so great, and after 150 hours of life the extra light afforded will, on the average, pay for the renewal of the lamp. With the "Mogul," a special porcelain socket and shade must be used. These do not have to be renewed, but are permanently attached to the fixture or suspending cord. The "Mogul" is especially well adapted for lighting large spaces where a steady, efficient and powerful light is required.

The factory of the New York and Ohio Company, at Warren, O., is now in full operation, turning out large quantities of the standard Packard lamps from six to 50 candle-power, as well as many orders for the "Mogul" lamps, which seem to meet a real necessity.

Another Electrocution.

Another electrocution, that of John Johnson, occurred in Auburn prison last week. Previous to the killing of the murderer, State Electrician Davis made a test of the prison dynamo. The test was made with a full grown calf for a subject. Several physicians, a few reporters and friends of the Warden witnessed the experiment. Two burly convicts held the calf while the electrodes were applied, one just back of the ears and the other to a hind leg. One thousand eight hundred volts were then sent through the calf, the animal falling to the floor at the first contact. The current was turned off and renewed several times. Considerable smoke or steam ascended from the electrode on the head, and there was a strong odor of burning hair. Davis pronounced the test entirely satisfactory, with the exception of a little unsteadiness on the part of the engine. The new armature is wound for 2,500 volts, but it will not be run higher than 1,800. The old armature was only intended to generate 1,000 volts, but was always run far above its capacity, and this strain was what caused its giving out at the Taylor execution.

Power from Niagara.

It was reported last week that the turbines for the Niagara Falls tunnel stored in Philadelphia have been telegraphed for, and water will be turned into the wheel pits of the paper mills about December 20. This will be the first application of electric power generated by tunnel power.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

Electric Light and Power.

NEW YORK, N. Y.—Judge Andrews, of the Supreme Court, has ordered the dissolution of the National Electric Light and Power Company, of 120 Broadway. It was incorporated on November 20, 1879, with a capital of $300,000, and has ceased to do business since April, 1883, having been leased to another company. There are no assets, and the only creditor is the United States Electric Lighting Company, whose claim is $4,551.

PORTLAND, ME.—A corporation to be known as the Baker Electric Lamp Company, has been organized at Portland, for the purpose of making and selling arc and incandescent lamps under Cutler's patent granted to Elbridge Baker. The officers are: President, F. A. Whiting, of Lowell, Mass.; treasurer, Chas. A. Stillman, of Lynn, Mass.

CANONSBURG, PA.—An electric light company, with a capital stock of $12,000, has been organized at Canonsburg, Pa. The officers are: John L. McClelland, president; Samuel McWilliams, secretary; and John S. Speer, treasurer. The company has secured a contract, for five years, for lighting the streets of the borough at the rate of $60 per arc lamp yearly.

PORTLAND, ORE.—The East Side Railway Company has filed incorporation papers with the county clerk. The capital is placed at $250,000, divided into 2,500 shares of $100 each.

MILWAUKEE, WIS.—The Milwaukee and Whitefish Bay Rapid Transit Company has been organized by Fred. Isenring, Max Zabel, Robert Gether, G. A. Rogers, A. F. Remington and T. W. Williams. The Humboldt avenue route may be utilized in building a line to the city.

SAN MARCOS, TEXAS.—An amendment to the charter of the San Marcos Electric Light and Power Company has been made, increasing its stock to $20,000.

WATERBURY, CONN.—The Connecticut Electric Company, capitalized at $200,000, has been absorbed by the Waterbury Traction Company. The stockholders will receive par value for the stock in five per cent. interest paying bonds, and the traction company will also pay a premium of 50 per cent. on $100,000. The traction company proposes to increase its capital to $600,000.

BALTIMORE, MD.—The Baltimore Electric Company, for the purpose of conducting a general electric business, was incorporated by Robert C. Rhodes, Phoebus H. Alexander, Charles C. Rhodes, Clarence C. West and Frank V. Rhodes, with a capital stock of $10,000.

COLLEGE POINT, N. Y.—The Whitestone and College Point Railway Company, to construct a street surface railroad about six miles in length, between and in the villages of College Point and Whitestone; capital, $60,000. Directors, I. J. Merritt, Jr., Moses Worms, Oliver Taff, D. Steffens and Harvey Place, of Whitestone; John F. Anderson, of Bayside; Harry D. Low, of Mount Vernon; Walter C. Foster, of Long Island City; and John J. Delaney, of College Point.

BROOKLYN, N. Y.—The Brooklyn, Bergen Beach and Canarsie Railway Company, to construct a street surface railroad, about 19 miles in length, to be operated by electricity. Its termini are: The boundary line between the towns of Flatlands and Gravesend at Flatbush avenue; the King's Highway and Avenue N; the boundary line between Flatlands and Flatbush, where the same crosses Nostrand avenue, Brooklyn avenue, Schenectady avenue, Utica avenue, Avenue C and Remsen avenue; the boundary line between the town of Flatlands and the city of Brooklyn, where the same crosses Avenue N; the junction of Denton avenue and East Ninety-fifth street; the junction of East Seventy-sixth street and Avenue X, and the southerly end of Flatbush avenue; capital, $200,000. The directors are: Thomas Adams, Jr., and Louis R. Adams, of Brooklyn; Percy G. Williams, of New York city; Frederick Rosebush, of Ozone Park; Henry E. Hughes, Charles E. Morrell and F. W. Lenken, of Canarsie; Daniel J. Wright and Alexander Stafford, of Flatlands.

The New York Belting and Packing Company, Limited, at the World's Fair.

AN INTERESTING EXHIBIT.

One of the most novel exhibits seen at the great World's Fair was that shown by the New York Belting and Packing Company, Limited, 13 Park Row, New York city. Their display, including the booth, was composed entirely of rubber. The effect produced was artistic in the extreme and claimed the attention of visitors at once. Everything was rubber—vulcanized rubber—for this concern has the credit of being the oldest and largest manufacturer of such goods in the world. The railings were made of rubber, the entrances and gates constructed of suction and air-brake hose, and the lower part of the railings latticed with bicycle pedels. The uprights noticed in engraving, one at either end of the booth, were built up of suction hose and crowned by the stars and stripes supported by rubber poles, each surmounted by a rubber ball.

The display of curios within the rubber structure was extensive and instructive. Among them were rubber shoes made by the natives of Brazil, from which country the company gets its supply of rubber; photographs showing the natives at work gathering and curing rubber, etc., also rubber playthings fashioned by them for their children. An immense Para rubber bottle weighing 600 pounds stood in the center of the booth and attracted considerable interest. There was also a section of an immense rubber belt (this concern has become noted for its large rubber belts), pneumatic sulky and bicycle tires of improved manufacture, among which the famous "Burris-Michelin" and "Whippet" tires were prominently displayed, footballs, rubber bottles, vulcanite emery wheels, many samples of steam, fire and air-brake hose and other rubber articles made for mechanical and household purposes. The visitor stepped upon one of the company's celebrated perforated rubber mats if he entered the booth to inspect these many interesting exhibits, passing beneath an arched entrance ingeniously constructed of several sections of suction hose, coupled together, from the rubber keystone of which he had received a true American invitation in the terse inscription thereon which read, "Walk In."

Notwithstanding the largeness of the booth, one wondered how the company managed to show off the many goods to such excellent advantage without placing some of them out of sight. The exhibit was one of the most striking in Machinery Hall, and showed the expenditure of an immense amount of time and attention and no inconsiderable display of ingenuity in its design and construction. The engraving on this page gives a very truthful reproduction of its appearance.

RUBBER GOODS
NEW YORK BELTING & PACKING CO Ltd.
15 PARK ROW NEW YORK
MECHANICAL RUBBER GOODS.
STAIR TREADS
NEW YORK BELTING & PACKING CO. LTD

WORLD'S FAIR EXHIBIT OF THE NEW YORK BELTING & PACKING COMPANY, LIMITED.

A Commutator Preserver.

A new commutator preserver has just been placed on the market by the E. G. Bernard Company, 43 Fourth street, Troy, N. Y. The claims made for it are that it does away entirely with the use of oil or greases on the commutator, that it will pay for itself many times over when used on commutators with either copper or carbon brushes, it enables the dynamo tender always to keep his machine in a cleanly condition, and it will preserve at least 50 per cent. of the life of the brushes and commutator. There is generally considerable difficulty in getting a perfect bearing between the entire surface of the brush and the commutator, until the brush has worn itself into position after some time. It is claimed that if this preparation is used in a proper manner when a new set of brushes is put on a machine, it will at once build up the brush so that it will bear its entire surface on the commutator, as there is said to be an element in this compound that readily assimilates with the carbon brush and becomes a part of it. The E. G. Bernard Company has used this preserver for several years in its own plants, and now places it on the market with the recommendation of successful experience to back it up. The price is low and the merits of the article are claimed to be correspondingly high.

Report of the Electrical Congress.

A committee of the American Institute of Electrical Engineers has concluded to arrange for the publication of the proceedings of the Electrical Congress, including papers and discussions, provided a sufficient number of subscribers can be obtained to guarantee the cost of the work. A circular on the subject is to be issued.

A printed record of the work of the Congress, in a convenient volume, will prove very desirable to the electrical fraternity. The work will be undertaken with the co-operation of the permanent secretary and chairman of committee on publication of the Congress, Prof. Francis B. Crocker, of Columbia College.

A Shafting Contract Awarded.

The Suburban Electric Company, of Elizabeth, N. J., have awarded the contract for the installation of counter-shafting, friction-clutch pulleys and quills and cut-off couplings for their model plant to Gifford Brothers, iron founders and machinists, of Hudson, New York.

The earnings of the New England Street Railway Company for October showed an increase of 25 per cent. over October, 1892.

KINDRED INTERESTS

The Ries Electric Specialty Company, Baltimore, Md., has removed from the corner of Baltimore and Eutaw streets to 7 South Gay street, where all communications should be addressed.

The Armington & Sims Engine Company's Catalogue Number 18, which may be obtained by addressing the company at Providence, R. I., is of more than usual interest and should be in the hands of every one at all interested in the steam engine.

Tobin bronze, manufactured by the Ansonia Brass & Copper Company, is rapidly gaining favor with naval constructors as a proper sheathing for yachts up to the water line. The victorious cup defender, "Vigilant," was coated with Tobin bronze and this has led other yacht builders to investigate its merits.

The Central Electric Company have met with great success in the introduction of their key socket, and among the number of flattering letters which have recently been received by them, showing the way the trade appreciate their efforts in placing upon the market such a superior device, they quote the following:

"Your favor of recent date at hand, together with the sockets sent for inspection. After examining the socket, I would say that it seems to be up to the standard in all particulars. The contacts are good and the weight and breadth somewhat greater than other styles. In fact, we rather like the looks of it, and you may ship your socket in place of the one ordered."

The Stirling safety water tube boilers have been given the highest World's Fair award covering all claims originally made, especially that of handling bad feed water. The constant and uninterrupted service, night and day, rendered by the 2,800 horse-power of Stirling boilers in use at the Fair, from May 1 to November 1, won for them the unqualified approval of all members of the Executive Board. Mr. Fred. A. Scheffler, 74 Cortlandt street, New York, general sales agent for the Stirling Company, has recently sold to the Providence Union Railroad, 1,000 horse-power of Stirling boilers in four units of 250 horse-power each, for immediate delivery, this order being given after severe competition, in which the merits of the Stirling were fully substantiated. Another recent sale was that of 975 horse-power to the American Straw Board Company.

Announcement of the Metropolitan Electric Company, of Chicago.

We beg to announce the incorporation of the Metropolitan Electric Company, with offices at 522-523 Monadnock building. The officers of the Metropolitan Electric Company are Wm. H. McKinlock, president; W. C. McKinlock, secretary. The Metropolitan Electric Company has absorbed the Enterprise Electric Company, which did a general supply business. The Metropolitan Electric Company, together with this business, will have the supervision of a factory and the entire output thereof, products of which will consist of H. T. Paiste's electrical specialties, comprising switches, sockets, porcelain rosettes, branch blocks, main line blocks, and general apparatus of this character. At our factory we hope to make a line of goods that will be of the latest designs and the best workmanship. We have retained the general western agency of the N. I. R. wire and cables, which are justly celebrated for purity of material used in their manufacture, and high quality of insulation which they possess. We have also made arrangements with other well-known manufacturers to handle their specialties, and hope to carry a large stock of staple goods, and by courteous treatment, fair prices, and prompt shipments, we trust we will merit your favors.

METROPOLITAN ELECTRIC COMPANY,
WM. H. MCKINLOCK, *President.*
W. C. MCKINLOCK, *Secretary.*

PERSONAL RECOLLECTIONS
OF
Werner von Siemens.

Cloth, $5.00.

In two very different fields—the application of heat and the application of electricity—Herr von Siemens gained pre-eminent distinction by his rare combination of scientific insight and power of practical utilization of his knowledge. He designed the ocean cable ship Faraday; an electric railway and an electric furnace were among others of his inventions; and in this day of electrical progress the autobiography of this great electrician will possess a pertinent and exceptional interest.

Sent to any address on receipt of price.

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13 PARK ROW,
NEW YORK.

WM. A. ANTHONY,
Consulting Electrical Engineer and Electrical Expert.

VINELAND, N. J.

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AN IRON BUILDING

For immediate shipment, 70 feet wide, 120 feet long, and 20 feet high to eaves, with continuous ventilator at ridge. Trusses are sufficiently strong to carry several lines of light shafting. This building is suitable for a Machine Shop, Power House, Boiler House, etc.

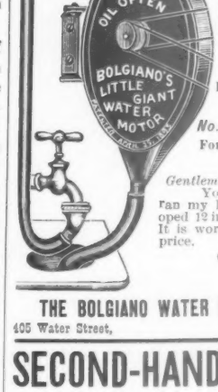
For further particulars, address

SHIFFLER BRIDGE COMPANY,
PITTSBURGH, PA.

WANTED.

A second-hand dynamo suitable to run 30 to 50 arc lights, also lamps.
Address P. O. Box 5077, BOSTON, MASS.

WATER MOTOR, $5.



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WILL RUN
DYNAMOS
and other machinery.
No Plumbing Required.
Delivered Free upon receipt of price.

No. 2 MOTOR, $10.
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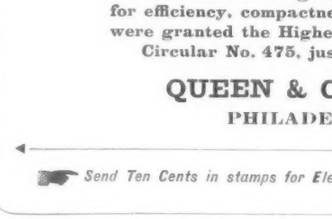

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